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EDITORIAL

AN INFECTION CONTROL PRACTICE: DISINFECTION OF DENTAL IMPRESSIONS

The infection control programme has become an important issue for dental clinic and laboratory personnel in recent years. Dental professional is exposed to a wide variety of microorganism in the blood and saliva of the patients. These organisms can cause disease such as the common cold, herpes, and pneumonia, and serious infectious diseases such as tuberculosis, hepatitis B & C and acquired immune deficiency syndrome (AIDS). The emergence of the blood-borne pathogens and increased number of infected patients who seek oral health care and compel clinicians to have a thorough knowledge about blood-borne diseases and the medical/dental management of the care of patients presenting with HIV, HBV or HCV infection. In the health care setting, blood-borne pathogens transmission occurs predominantly by percutaneous or mucosal exposure of health care workers to the blood or saliva of infected patients. Cross- infection among dental surgeons, dental assistants, dental technicians and patients can be prevented by the use of effective infection control procedures and standard precautions (Universal precautions) in dental office and laboratory. The common practice for avoiding cross infection is the sterilization of all items contaminated directly or indirectly with blood or saliva. Although the sterilization procedures can be easily carried out in other disciplines of dentistry, it is not as readily feasible in prosthodontic practices, especially in disinfection of dental impressions. Impressions, trays, casts, wax record blocks and prostheses are all potential sources of cross-contamination to and from patients, clinical personnel and dental technicians. The Lakshman (1991) stated that the number of oral bacteria retained on impression material were significantly higher in dentate than edentulous patients.

Disinfection of dental impressions was not a routine procedure until the late 20th century; when the outbreak of AIDS brought up the need for infection control in dental practice. To reduce the potential for cross-contamination between clinical area and laboratory, sterilization of impression by dry or moist heat is not suitable and therefore cold sterilization or disinfection method becomes the only alternative for this purpose. The clinician and laboratory technician should follow the instruction and recommendation of the manufacturer in selection of an appropriate

solution for disinfection. The British Dental Association, BDA (1987) and Federation Dentaire Internationals, FDI (1987) stated that matters of all patients should be cleaned and disinfected before delivery to the laboratory. The American Dental Association (ADA, 1985) recommended chemical disinfection of all impressions and prostheses and also published guidelines (1996) for infection control of the dental office and commercial dental laboratory. When treating patients known to be carriers of blood- borne diseases such as HIV or HBV or HCV, special precautions are recommended and the only safe approach is to assure that all patients should be assumed to be carriers. So the disinfection procedure of dental impressions is one of the most imperative infection control programmes and must be performed in general dental practice and laboratory.

Cross-contamination within prosthodontic practice requires an on-going research programme to develop and improve present methods of infection control procedure to better protect against the dissemination of diseases. Therefore disinfection of dental impression methods is embedded to prevent the spread of disease directly or indirectly to dental personnel. As the growing body of research suggest, it is essential to develop an effective means of disinfecting materials, including dental gypsum casts before their transfer to dental laboratory personnel. So some effort has been made to ensure that dental casts are cross-contaminated from the contaminated impressions. Moreover, dental gypsum casts can be reinfected when the acrylic resin record block is placed intra-orally and replaced on the dental cast. The most of impression materials especially, hydrocolloid impression materials have been contaminated with viable bacteria, fungi and yeast and the contamination detected within the impression materials points to the need for adopting measure to improve the microbiological quality and quantity of these materials. Then the use of contaminated materials in the oral cavity goes against the basic principles for control of cross-contamination and may represent a risk of debilitated or immunocompromised patients, and may also be complicated with plaque of oral microflora and occurrence of consequent diseases may be brought about in these patient. Therefore, the gaseous ethylene oxide is an effective sterilization

agent used for decontamination of impressions and gypsum powder at considerably lowered temperature than those attained in autoclaved or in dry heat sterilizer. (Firtell et al 1972)

The various types of disinfectant are commercially available in Myanmar market, but specific recommendation about which one to use is primarily based on the disinfection property of the disinfectant per se. Chemical sterilants or disinfectants can be broadly classified into three categories. High level disinfectants are able to inactivate spores and all other microbial forms e.g. gaseous ethylene oxide spray and immersion glutaldehyde solution. Intermediate level disinfectants may not inactivate spore but will destroy other microbes in particular tubercle bacilli e.g. formaldehyde, chlorine compounds, iodophor, alcohols and phenolics compounds. Low level disinfectants include quaternary ammonium compounds, simple phenolics and detergents. The high level and intermediate level disinfectants are recommended to protect against HBV and HCV infections. The commonly used chemical disinfectants are alcohol, aldehydes, chlorine compounds, phenolics, iodine compounds and quaternary ammonium compounds. There are three methods of cold sterilization usually exists soaking or immersion, spraying and mixing with or as a substitute for water used to mix with impression material or gypsum plaster.

The preliminary study has outlined a multiple barrier system developed to prevent cross-contamination in the prosthodontic laboratory. The system involves protocol of specific and sequential steps for disinfecting dental impressions, casts and prostheses as they enter and leave the laboratory. The primary phase of this system works to attack the infectious microorganisms harbouring on the surface of the impression by static immersion in a disinfectant solution before the impression has been poured. The second phase attacks the microorganisms during the impression has been poured by gypsum plaster mixed with liquid containing disinfectant agent. Alternatively, a gypsum plaster containing an antimicrobial agent (e.g. chloramin-T) can be used in some cases of circumstances. The third phase involves exposing the gypsum casts to a disinfectant solution. An advantage of barrier system is that all works coming to the laboratory are decontaminated so that all impressions and casts could be quite safely

utilized in fabrication procedure and then disposed of normal waste collections. As the necessity for disinfecting impressions or casts has become apparent, the process itself should have no adverse impact on the dimensional accuracy of resultant gypsum casts. The various types of solution used for disinfection of dental impression may affect crucial qualities of impression materials, potentially altering surface detail reproduction, surface roughness and dimensional stability.

Therefore, the ultimate goal is to achieve the high level disinfection or sterilization in the shortest possible contact time with no significant degradation of the physical properties of impression and gypsum cast. Every member of dental health team has a duty to ensure that all necessary steps are taken to prevent cross-infection to both their patients and themselves. More emphasis should be placed on infection control programme in dental school curriculum to ensure that graduates institute sound principle in practice. All dental staff should comprehensively understand and drain the policies adopted in the practice for prevention of cross infection and all impressions should be rinsed with some forms of disinfectant thoroughly before sending them to the laboratory, and all technicians should be encouraged to wear safe gloves at all times when handling of impression and pouring of cast.

One of the experimental research studied in Myanmar revealed that 0.5% sodium hypochlorite disinfectant immersion solution was utilized in disinfection of irreversible hydrocolloid alginate impressions and gypsum stone casts for ten minutes interval. This immersion method displayed the sterile result of bacterial investigation procedure and also showed few significant changes in physical properties of resultant gypsum stone casts. Therefore ten minutes immersion method with 0.5% sodium hypochlorite solution is a very effective in infection control practice and safe method for disinfection of dental impressions procedure.

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4. A review on disinfection of dental impressions in infection control practices, a lecture talk by Dr. Ko Ko , in Continuing Dental Education Program of Myanmar Dental Association, 29th Aug 2010.

Review Article

Ameloblastoma : Approaches to diagnosis and management

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Introduction

The Ameloblastoma is the most frequently encountered of all the odontogenic tumours. The theory of an odontogenic origin for the ameloblastoma is supported clinically by the tumors common occurrence in the tooth bearing area. Arising from one of the following sources: (1) cell rests of the enamel organ, (2) epithelium of odontogenic cysts, (3) disturbances of the developing enamel organ, (4) basal cells of the surface epithelium or (5) heterotrophic epithelium in other parts of body. Adamantinoma may be considered misnamed as much as adamantin (enamel) is not a product of the tumour. Traditionally considered as a benign epithelial neoplasm with no virtually tendency to metastasize. It is a slow growing but locally invasive with high rate of recurrence if not removed adequately.

Clinical presentations

The Ameloblastoma occurs usually in fourth and fifth decade of life. It can also occur in children and elderly. The 80 % occur in mandible and 70 % at molar - ramal region. It is located centrally or intraseously in both jaws and there are few or no clinical signs in the early stages. They are discovered during routine radiographic examination. Later, the bony hard nontender local swelling of ovoid or

fusiform in outline with buccal and lingual bulging are noticed. Some cases seek for treatment only when there is an obvious facial deformity.

Pain occurs seldom, the cause of the pain is pressure from the tumour on the peripheral nerve or secondary infection. Sign of numbness are due to involvement of the inferior alveolar nerve or infraorbital nerve. The tumour that continues to enlarge may cause the surrounding bone to become so thin that crepitus or egg shell crackling may be elicited. The teeth in the area may become loose or out of alignment. When present in maxilla may extend to involve surrounding structures including the maxillary sinus, nasal, nasopharynx, orbit and skull base. It is fatal once there is an intracranial extension, secondary infection or malnutrition due to interference with mastication.

Radiological Presentations

The essential radiographic views for mandible are Lateral oblique of both side and Posteroanterior view and for the maxilla are Occipitomental view and true lateral. The Orthopantomograph can be taken instead of conventional views. Because of slow growing, radiographic margin are well defined and sclerotic, usually corticated – locule. CT or MRI can help better delineate the true extent of the lesion.



A multilocular appearance is by far the most commonly seen although it can appear unilocular as well with round, oval or scalloped outline. It can be either totally radiolucent or radiolucent with septa. The internal septa are most commonly coarse and curved in outline. The septa give it a honey comb (small loculations) appearance which has been associated with the solid form as opposed to the cystic form of the lesion, or soap bubble (large compartments) appearance. It causes extensive root desorption, divergence of the root and the displacement of teeth. The differential diagnoses of multilocular appearances are Ameloblastoma, Primordial cyst, Kerato cyst, Myxoma, Ossifying fibroma, Central giant cell granuloma,



Figure 2. Unilocular with divergence of the root

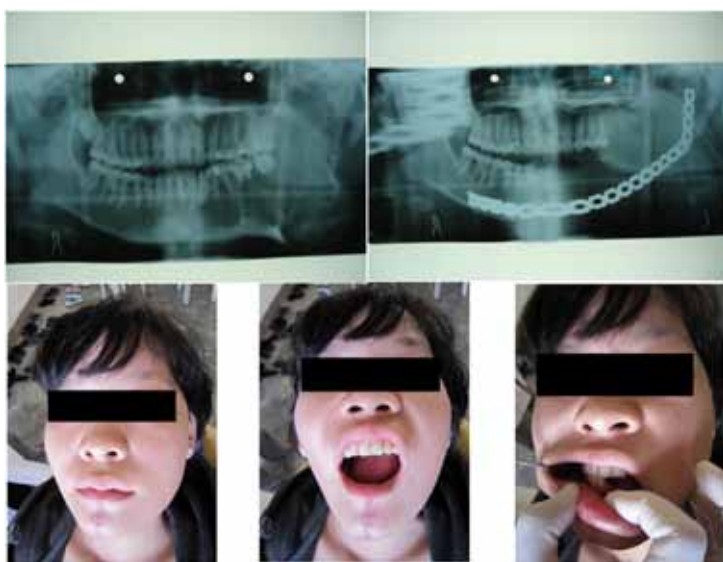


Figure 10. Post operative follow up



Figure 11. Maxillary approach through Weber Furguson's approach

Hyperparathyroidism, Central haemangioma and Aneurysmal bone cyst.

The well defined area of radiolucency that forms a single compartment appears as Unilocular. Closely resembles that of dentigerous cyst, when associated with the unerupted tooth. Associated with impacted teeth are usually mandibular third molar and maxillary canine. The differential diagnoses of unilocular appearances are Odontogenic cyst, Dentigerous cyst, and Odontogenic tumour.

Macroscopic appearance

Macroscopically the tumour appears as a greyish white or greyish yellow mass replacing the bone. Solid multicystic Ameloblastoma (SMA) is completely solid but in most cases cystic spaces are present. These are generally quite small and scattered randomly. Less frequently the cysts are larger and the whole lesion has the appearance of multicystic lesion. The cyst content varies from straw coloured fluid to semisolid, gelatinous material. The unicystic ameloblastoma (UA) consists of only a single cyst, in which case there may be a close resemblance to odontogenic cyst. Both SMA & UA can give both radiological appearances. The SMA is typically multilocular and UA is a clear predominance of the unilocular.

Microscopic variants

In the Follicular type the islands consist of a central mass of polyhedral cells or loosely connected angular cells resembling stellate reticulum surrounded by a layer of cuboidal or columnar cells resembling internal dental epithelium or preameloblasts. Cystic degeneration commonly occurs within the epithelial islands. In the Plexiform type the tumour epithelium is arranged as a network / strands which is bounded by a layer or cuboidal to columnar cells resembling stellate reticulum. Cyst formation occurs but is usually due to stroma degeneration rather than to a cystic change within the epithelium. Mixed type is when both patterns follicular and plexiform coexist. The other histological sub-type are Acanthomatous, Granular cell, Basal cell type, Clear cell type, Keratoameloblastoma and Hemangiomatous ameloblastoma, Peripheral Ameloblastoma.



Figure 3. Multilocular with root resorption of the 6&7 and displacement of the 8

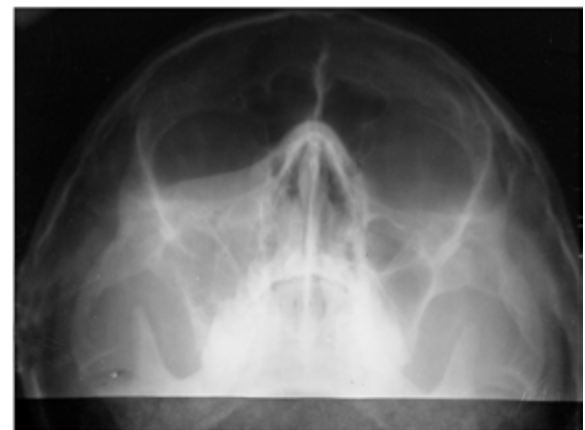


Figure 4. Ameloblastoma involving the right maxilla ill-defined and bone destruction of the lateral wall of the maxilla



Figure 5. Preoperative and intraoperative findings. Appears as a grayish white or grayish yellow mass replacing the bone

The Malignant Ameloblastoma is a neoplasm which metastasizes but histologically demonstrates features of typical ameloblastoma in both primary and secondary lesion. Lung is the most frequent target followed by liver, kidney and lymph node. Ameloblastic carcinoma is a neoplasm demonstrates histological evidence of malignant transformation of the ameloblastoma like epithelial component in the primary tumour whether or not it has metastasized. Metastatic lesion often does not resemble the primary tumour but rather a less well differentiated carcinoma.

Eversole et al in 1984 described Desmoplastic ameloblastoma which is characterized by extensive stromal collagenization or desmoplasia with small nests and stands of odontogenic epithelium. Hybrid lesion of ameloblastoma was first described by Waldron and el-Mofty in 1987 and is one of the variants of ameloblastoma, in which, histologically, areas typical of classic follicular or plexiform ameloblastoma coexist with areas characteristic of desmoplastic ameloblastoma. In 1977 Robinson and Martinez described unicystic ameloblastoma as a distinct variant of ameloblastoma, which has been sub-group into four different entities. They are luminal, luminal and intra luminal, luminal, intra luminal, and intra mural, luminal and intramural types.

Management

There is no single standard type of therapy for ameloblastoma. Type of the operation depends upon site of the primary tumour, size of the lesion, age of the patient and type of the ameloblastoma. The primary tumour at more posterior region should have drastic surgery. The small lesion responds to curettage without resecting the jaw. The younger case is mostly unicystic and treated conservatively by enucleation. The Unicystic require only conservative surgery by enucleation. However, the unicystic ameloblastomas showing mural proliferation are considered invariably



Figure 6. Floating appearance of the teeth in the X ray and root resorption



Figure 7. Ameloblastoma involving the premolar to premolar region
Segmental resection of the involved region

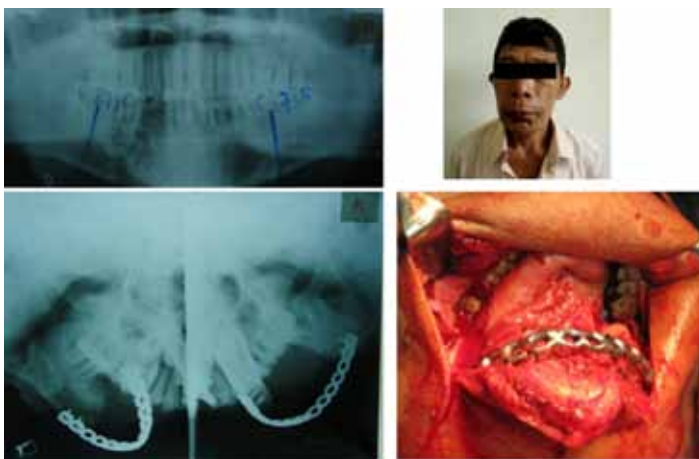


Figure 8. Reconstruction of the resected region

aggressive and should be treated in the same manner as solid multicystic ameloblastoma. The Peripheral ameloblastoma should be treated conservatively by suprapariosteal surgical excision with adequate disease free margin. The Solid / Multi cystic require radical surgical intervention and reconstruction.

Recurrence

Complete eradication of the tumour depends upon accessibility, completeness of the removal of tumour and skill of the surgeon. Recurrence is due to incomplete removal rather than aggressiveness. The full extent of tumour is not always appreciated at the time of treatment. The presence of Daughter cyst (Satellite), infiltrated microscopic growth in the bone beyond the 10 mm, even though this is not apparent in both the clinical and radiological evidence. The Unicystic ameloblastomas showing mural proliferation are considered invariably aggressive. According to WHO data, the unicystic with no mural proliferation and peripheral have lower recurrence rates than other ameloblastoma. However, Desmoplastic has a potential for recurrence similar to Solid.

Follow-up

Characteristic of slow growth is significant in that it may take years before the recurrence becomes evident. In the study, recurrence rate still cannot be fully appreciated due to relatively few reported cases with sufficiently long follow up periods. It is absolute necessity for long term life long follow up (rest of the patient's life) for early detection of any recurrence. The surgical sites are examined thoroughly including X-ray. The Chest X Ray must also be taken periodically to spot metastasis. If spotted, should be surgically removed without delay.

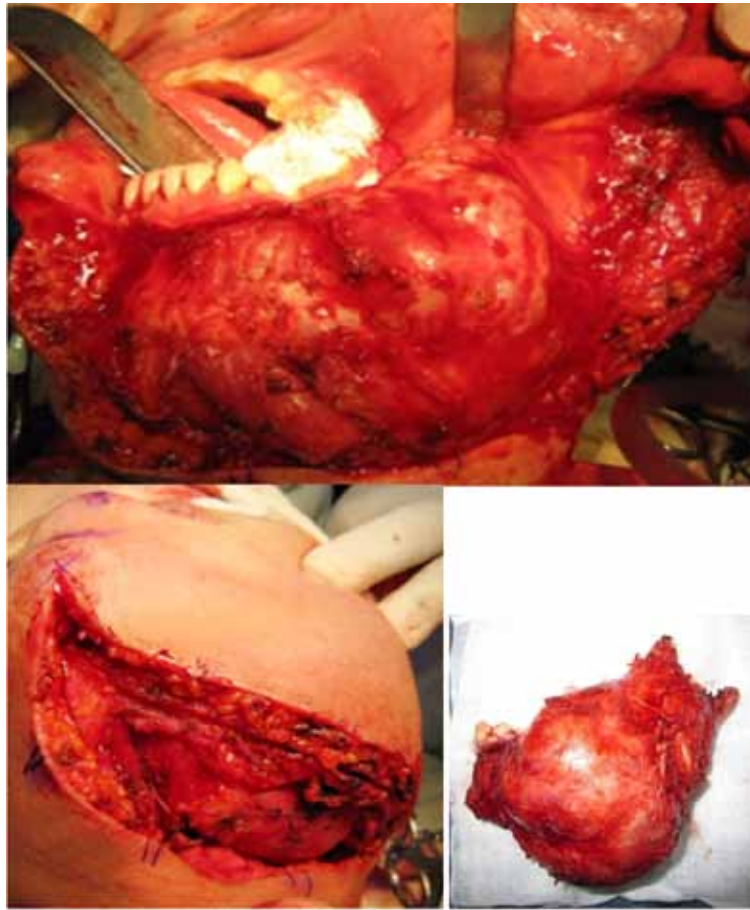


Figure 9. Ameloblastoma involving the half of the mandible Hemimandibulectomy

Conclusion

Ameloblastoma is the most common odontogenic tumour which is benign and locally invasive with high recurrent and rarely metastasis. The Molar –ramal region of the mandible is the commonest site and classically appears as buccolingual bulging. Radiologically multilocular and involved teeth may be displaced, diverged or have root resorption. Macroscopic and Microscopic examinations determine the nature of the lesion. Life long follow up is essential for early detection of the recurrent.

The clinician should be aware of the followings;

- The Odontogenic Cyst and cystic lesion are very common
- Histopahtological examination of the Dentigerous cyst should be serially check to exclude the ameloblastoma arises from the epithelium of the cyst wall
- Any tissue taken from the patient should be sent for hitopathological examination
- Any recurrence of the cyst should be in doubt for other aggressive pathology
- Aspiration is not the treatment. It is an adjunctory test for diagnosis
- Extraoral Essential views – for any large lesion for the assessment

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Original Article

Assessment of obturation on the simulated lateral canals of root canal system between heat only and heat associated with vibration technique

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Abstract

Introduction: Lack of adequate sealing of the lateral canals can cause secondary infection lead to root canal treatment failure. Root canal can be filled three dimensionally with heat- softened gutta-percha (GP) during obturation. **Objective:** To evaluate the effectiveness of heat only and heat with vibration obturation techniques, by measuring the percentage of GP penetration length inside at the three levels of simulated lateral canals within a root canal system. **Methods:** A quantity of 70 mandibular second premolar teeth was used in this experiment. Three simulated lateral canals with the diameter of 0.15mm at coronal, middle and apical third on the distal root surfaces were created. All created teeth were randomly divided into two groups as Group G1 and G2 (n=35). Main canal of teeth in both groups were prepared with K3 rotary file in crown-down technique. Irrigation was performed alternate use of 5.25% NaOCl and 17% EDTA in both groups during canal shaping. G1 was obturated under heat only continuous wave of condensation technique using system B heat source. G2 was obturated with under heat and vibration technique using DownPak device. Filled teeth were radiographed at the bucco-lingual direction and all images were transformed into a digital format. Length of the simulated lateral canals and GP penetration inside the lateral canals (coronal, middle and apical thirds) were measured by VixWin Pro 2000 software and the GP percentages inside the canals were calculated. Data were analyzed using ANOVA test. **Results:** Mean percentage length of GP revealed significantly higher at the apical third level of lateral canals ($p<0.05$) by the using of heat associated with vibration technique. **Conclusions:** Heat with vibration technique was found to be superior to heat only technique for obturation especially at the apical third level of root canal.

Keywords: obturation, lateral canals, heat, vibration

Introduction

The important step of filling and sealing the root canal system is known as obturation which

purpose is to prevent bacterial growth and penetration of fluid and antigenic agents between the canal and periapical tissues (Jarret et al., 2004). The branches of accessory or lateral canal from the root canal system communicate to the periodontium at along the different levels of root canal form as multiple of exits. These two ways opening (portal of exits) can lead into persistent inter-radicular or secondary infections that can cause root canal treatment failure (Ruddle, 1992). De-Dedus (1975) found lateral canals in 27% of 1140 teeth, whereas in 17% of the teeth they were located in the apical third, 9% in the middle third and 2% in the coronal third with the diameter of 100-150 μ m. These small canals do not allow direct access during biomechanical preparation because of their position and also diameter (Venturi and Breshi, 2005). Lack in lateral canals obturation will lead to spreading of infection through the portal of exit, so that these accessory canals should hermitically be sealed during obturation. Proper root canal filling should be compact and completely sealed with inert or antiseptic materials. The standard of care should be three-dimensionally intended for obturation of the entire root canal, without any void formation (Dumsha and Gutmann, 2000). Gutta-percha (GP) and root canal sealer are currently the obturation materials of choice (Nguyen, 1994). The heated moldable GP can easily be compacted and replaced into the original pulp anatomy of the entire root canal. The objective of warm GP obturation is to fill all the portal of exits with maximum amount of GP. During warm GP obturation process, the heated soften GP is moving down into the root canal with vector of forces both apically and laterally. Buchanan introduced System B intra canal heating device in 1996; the single continuous wave for warming GP in the canal. It monitors temperature at the tip of heat carrier plugger to deliver a precise amount of heat and it was designed to fill the apical root canal system with a single continuous wave of thermo-plasticized GP (Buchanan, 1996). Moreover, some studies found using of ultrasonic plugger improved GP condensation reduce dye leakage in comparison with cold lateral condensation (Baumgardner and Krell 1990; Bailey et al 2004). The new handheld cordless unit, (DownPak, Hu-Friedy, Chicago, IL), which utilize both heat

and vibration to compact and disperse GP into the root canal system. The heated plugger with vibration can enhance more homogenous distribution of GP into the all space of root canal system for three-dimensional sealing for better clinical outcome. However, no comparative study so far has investigated the efficiency of warm vertical obturation methods on lateral canals between heats only and heat associated with vibration techniques.

The objective of this study is to evaluate the effectiveness of heat only and heat with vibration obturation techniques, by measuring the percentage of GP penetration length inside at the three levels of simulated lateral canals within a root canal system.

Materials and methods

A total of 70 mandibular second premolar teeth with single root were selected. The selected teeth were stored in a 1% sodium hypochlorite (NaOCl) solution for two days to remove any organic debris and thereafter, the teeth were stored in normal saline solution until the procedures were started. Afterward, all selected teeth were scrubbed with ultrasonic scalar (EMS, Switzerland) for cleaning process. The cleaning process was followed by the method of Oliver and Abbot (1998).

Artificial lateral canal

Artificial lateral canals for every tooth were created at the distal surface of the apical third, middle third and coronal third of root with the diameter of 0.15mm. The locations of the perforation were initially marked with 012 round diamond bur in low-speed. The instruments for the making of artificial lateral canals were No.15 engine reamers (MANI, Japan) rotated by slow-speed hand piece. The canals were prepared with isolated straight movements until reaching the empty space of the main canal. One reamer was used for only five teeth. This methodology was adapted following Goldberg et al. (2001).

For root canal preparation, the teeth were randomly divided into 2 groups (G1 and G2) by using block randomization method with 35 teeth in each group respectively.

Preparation of the root canal (G1 and G2)

Conventional access cavity was prepared using a size 012 round diamond bur in a high speed water-cooled handpiece and working length was

determined by passing a size No.10 file (Kerr, USA) carefully along the canal until tip of the file was just visible at the apical foramen, then subtract 1mm from the length and the rubber stop was positioned and the length measured. Preparation of the root canals was continued with using nickel-titanium K3TM rotary files (SybronEndo, USA) with crown down canal preparation technique, starting by taking of 0.12 taper file to resistance for orifice opening then following 0.10, 0.08 and was finished by 0.06 taper No. 25 files up to the working length. Files were changed to the next size when no resistance was felt. The files were driven by using a 16:1 reduction headpiece in X-Smart torque control motor unit (Densply, Japan) set at 250rpm of rotation speed. The canal was enlarged in a funnel shape from the coronal orifice towards the apical foramen with progressively smaller files until the desired length was achieved. Each set of rotary files was discarded after preparing five canals.

Root canal irrigation during instrumentation

Root canal irrigation was performed by the alternate use of 5.25% NaOCl (Rillins Sains (M), Sdn. Bhd, Malaysia) and 17% EDTA (MD-Cleanser, Korea) after each instrument change. The irrigants were delivered with an endodontic syringe with a 27- gauge blunt needle (Terumo, Japan) that was placed down the canal until slight resistance was felt. Canals were kept flooded with irrigant during the instrumentation phase.

Root canal obturation for G1

All teeth in G1 was obturated by the continuous wave of condensation technique (Buchanan, 1994) using System B Heat Source (SybronEndo, USA). Continuous wave was carried out both apical and back filling. The canal was dried with the 0.06 paper points (SybronEndo, USA) before obturation. K3 GP cone with 0.06 taper was placed in the apical third of root canal. The GP was adjusted 1mm short of working length until a tug-back was achieved. During obturation the tooth was held in wet gauze to maintain tooth moisture. A System B medium sized plugger was marked at its point with a rubber stop at the 5mm away from the working length. The apical master cone was coated with very thin film of AH-26 (Densply Detrey GmbH, Konstanz, Germany) canal sealer and placed into the canal. The heat source was adjusted to 200°C at full power and touch mode was activated. Seared off the excess GP at the canal orifice with heated plugger first. The heated plugger

was driven through the GP until the rubber stop approached the reference point. During the down pack the plugger was moved apically slowly. The plugger was then deactivated; firm apical pressure was held for 10 seconds. After this downpacking procedure backfilling was completed for the remaining space till GP was filled up to the coronal orifice. Glass ionomer cement (GIC) was placed into the orifice over the filled GP. This methodology was adapted following Keccei et al. (2005).

Root canal obturation for G2

All teeth in G2 were obturated by heat and vibration technique using DownPak device (EI-Endo, Hufriedy, USA). The canal was dried with 0.06 paper points before obturation. K3 GP cone with 0.06 taper was placed in the root canal and trimmed 1mm short of the working length until a tugback was achieved. The 0.06 tapered DownPak tip, was set at the 5mm short of working length and a rubber stop was positioned at this point. During obturation the tooth was held in wet gauze to maintain tooth moisture. The cone was coated with very thin film of sealer AH-26 and then replaced into the canal. DownPak plugger tip was activated (heat 200°C and vibration 100 MHz) and driven through the GP until rubber stop approached the reference point. At this depth, heat was deactivated and vibration was maintained until the DownPak plugger reached the level set by the rubber stop (5mm from the working length). Afterward, apical pressure was maintained for 8 seconds, and then the plugger was removed from the canal. For the remaining space, insert additional GP in approximate 5mm segments and repeat the procedure without vibration. The methodology was adapted following Cohen (2008). GIC was placed into the prepared root canal over the GP. All procedures for obturation were performed by only one trained operator to control the intra-operator inconsistency.

Sample analysis

After obturation, the teeth were put into labeled containers and stored in room temperature for one week to ensure that all filling material had set. For the taking of radiography, the sample tooth was placed onto the X-ray sensor phosphor plate (GENDEX, Germany) in bucco-lingual direction fixed with adhesive tape. The postoperative radiographs were taken in bucco-lingual direction using Oralix AC intra-oral X-ray machine at the distance of 16cm away from the X-ray tube with 60 kV, 80mA, for 0.1s. After radiograph had taken, the

tooth was removed from the sensor and then the sensor was inserted into the digital image scanner (DenOptex, Germany) which was connected to the computer for the scanning purposes. After scanning the images were saved in VixWin™ pro 2000 software installed computer as JPEG format.

Based on the digital images, the total length of each of the three simulated lateral canals in each tooth of both groups was measured. Likewise, the linear extension of the obturated material in each canal was determined. These measurements were obtained using VixWin™ pro 2000 software in millimeters, with an accuracy of 0.1mm. Measurements were conducted by trained person who was blinded for canal preparation and obturation technique. The measurements obtained by image analysis were repeated two times to ensure reproducibility. The second time measurements were performed one week after first time. Reproducibility of two times measurement for lateral canals length and GP penetration length inside the canals for all specimens was analyzed by intraclass correlation coefficient (ICC) test. Subsequent to all measures were done, the penetrated GP into the lateral canals was transformed into percentage (PGP).

Statistical analysis

The data were analyzed using Statistical Package for the Social Sciences (SPSS) version 12.0.1 (SPSS Inc., Chicago IL). The variables were checked for overall fitness in the model and also checked for assumptions. One-way ANOVA was used to compare the mean different between two groups for preliminary data analysis. Multi-factorial ANOVA was adopted, where the main factors are obturation techniques (heat only and heat with vibration) and all levels of the root canals (Coronal, middle third and apical third level). For the comparison of mean different between main factors, Bonferroni adjustment was made.

Results

Table 1 shows the descriptive statistics of the result of the percentage of GP penetration (PGP) into the each levels of root canal. The significant result was found in apical third level between two techniques. Figure 1 shows the graphic illustration of PGP penetration at the each levels of root canal by obturation with heat only and heat with vibration techniques. Multi-factorial ANOVA analysis shows PGP at apical third by two obturation methods was significantly different ($p < 0.05$). Figure 2 shows the

digital photographs of obturated teeth between heat only technique using System B heat source and heat with vibration technique using DownPak device. The photographs indicate the significant difference of GP penetration between two obturation techniques.

Factors	n	Percentage of GP penetration (PGP) %			
		Mean (SD)	Mean diff	F statistics (df)	p value
Coronal					
Heat only (G1)	35	78.70 (4.55)	1.47	3.60 (1, 67)	0.06
Heat with vibration (G2)	35	80.17 (4.31)			
Middle					
Heat only (G1)	35	78.78 (5.61)	1.12	1.99 (1, 67)	0.16
Heat with vibration (G2)	35	79.90 (4.78)			
Apical					
Heat only (G1)	35	44.50 (15.81)	34.73	258.66 (1, 67)	0.01
Heat with vibration (G2)	35	79.23 (4.50)			

Table 1 Comparison of percentage of gutta-percha penetration (PGP) between two obturation techniques and each levels of root canal using ANOVA test

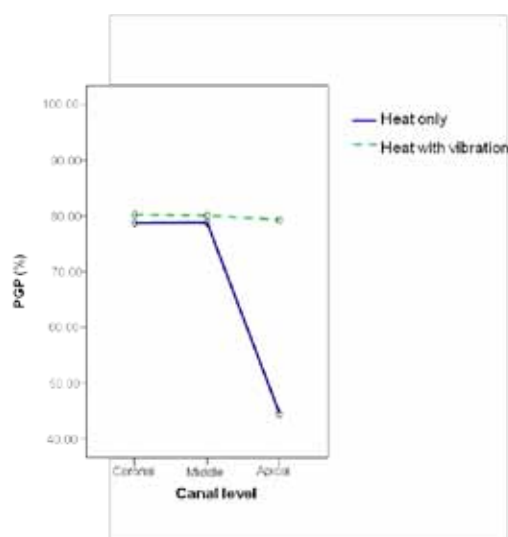


Figure 1 Graphic illustration of PGP penetration at the each levels of root canal by obturation with heat only and heat with vibration techniques. Multi-factorial ANOVA analysis shows PGP at apical third by two obturation methods was significantly different ($p < 0.05$).

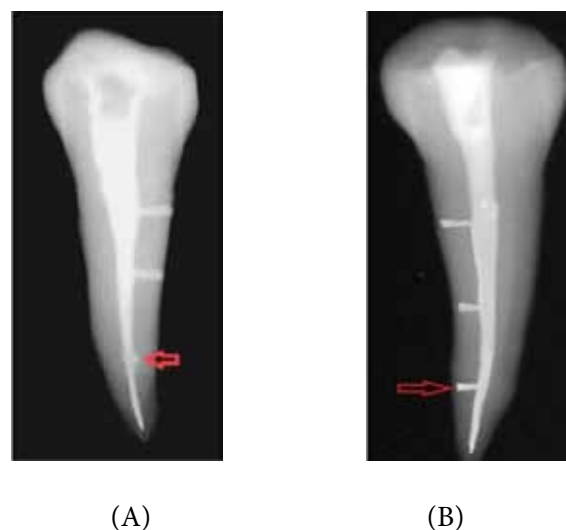


Figure 2 Digital photographs of obturated teeth by two techniques (A) Heat only technique using System B heat source (B) Heat with vibration technique using DownPak device. Arrows indicates the significant difference of GP penetration between two obturation techniques.

Discussions

Effect of warm vertical compaction

Several obturation materials and techniques were suggested to achieve better obturation of the lateral canals (Wolcott et al., 1997; Dulac and Nielsen, 1999; Barbizam et al., 2007). Vertical condensation of warm GP (heat only method) produces consistently dense, dimensionally stable, three-dimensional root canal fillings at the apical portion of the filling. However, unexpected failure can still occur in warm vertical technique when perfect coronal and apical seal was achieved (Kim, 2010). This failure may be due to the remnants of partially or totally unfilled lateral canals which could become necrotic or infected and contribute to lateral root abscesses. The lateral canals of apical region are the most difficult to obturate and the quality of the endodontic treatment strongly influences the healthy status of the periradicular tissues as long as possible (De-Moor et al., 2000). There was comparing the effects of heat only warm vertical condensation technique and heat with vibration technique in this study. For heat only technique System B (SybronEndo, USA) heat source was used and DownPak (EI-Endo, Hufriedy, USA) device was used for heat with vibration technique. Percentage of GP penetration (PGP) inside the lateral canals indicated as a quality of obturation technique in this study. The size and shape of the root canal as well as the corresponding size of GP cone and pluggers size may affect the quality of root filling (Cathro and Love, 2003). To control these effects, the mandibular second premolar teeth with single, straight and relatively curve canal were selected. The 0.06 taper standardized single cones GP were used to fill the canals with relative plugger size. In this study, simulated lateral canals were created in natural human teeth in order to obtain real clinical condition as close as possible. The diameters of created canals were 150µm, which is in accordance with the size of lateral canals in previous studies (Goldberg et al., 2001; Venturi and Breshi, 2005).

The lateral canals were slightly tapered shape from outer root surface to inner root canal space. This taper does not improve the flow of GP, because of wider external opening to the root surface.

Warm vertical technique and apical third Warm vertical condensation techniques were aimed to be plasticizing of the GP apical to the heat carrier (Schilder et al., 1985; Buchanan, 1994). However, whether the heat actually is sufficient to stimulate phase change in apical portion of the GP is questionable (Venturi et al., 2002). A problem

encountered in small canals during the application of warm vertical compaction is difficult to obtain real thermal effects at the apical portion of the GP (Goodman et al., 1981). Electric heat devices, such as the Touch'n Heat (Analytic Technology, Redmond, WA, USA) and the System B Heat Source have been developed to allow an easier approach for vertical condensation. However, it has been demonstrated that there is almost no temperature rise within the apical GP when using these devices in narrow canals (Venturiet al., 2002). Moreover, the compaction with heated plugger only (without vibration) might be insufficient to get good GP adaptation into narrow canals.

Comparisons of percentage of filled GP (PGP)

Warm vertical continuous wave of condensation technique (heat only) employed with System B heat source resulted less mean PGP at the apical third of the lateral canals compared to warm vertical continuous wave technique with vibration using DownPak device (Table 1). Concerning the heat only technique, similar findings were demonstrated in other studies. The ability of heat-softened GP penetration into wide lateral canals at coronal and middle thirds levels were obvious but poor result were revealed in obturation of small apical canals (Dulac et al., 1999; Silver et al. 1999).

Higher percentage of GP penetration at the apical level in this study could be due to the vibration effect produced by the device gave more effective compaction of heated moldable GP into small surface irregularities, small lateral and accessory canals. Particularly, the wave of vibration is directed towards softened GP to all directions of the canal including the apical third and resulting a complete three-dimensional filling of the lateral canals with higher mean PGP during GP compaction.

Effect of plugger depth during obturation

Some studies have indicated that in gradually tapered root canals, the deeper application of plugger, the better adaptation of GP will be achieved (Smith et al., 2000; Wu et al., 2002; Gordon et al., 2005). Sweatman et al. (2001) explained that warm vertical condensation techniques usually enhance some temperature rises in GP close to the apex, 4-5mm away from the working length. In contrary, Silver et al. (1999) suggested that the quality of GP adaptation is better in the apical level of root canal if heat is applied 2mm away from the working length. However, care must be taken while softening the GP in apical region

that may lead to poor control of the material with possible extrusion.

Biological problems relate to possible damage of periradicular tissues were found when the GP is heated inside the root and the residual dentine walls are thin (Lee et al., 1998). With the deeper penetration of plugger, heat radiation can cause thermal injury to the apical periodontium as the root thickness of the apical region is rather thin. The endodontic heating devices must ensure good quality fillings without harming the periodontal tissues and the recommendation is that the tip of the heated plugger should reach no closer than 5mm from the working length (Lee et al., 1998). The apical extrusion of material beyond the apical foramen also has negative effect to the healing of apical lesion (Saunders et al., 1997). Throughout this experiment no extrusion of GP from the opening of the apical and lateral canals was encountered in both techniques (heat only and heat with vibration).

The data analysis showed no significant differences ($p>0.05$) of mean PGP inside the lateral canals at coronal and middle third between two techniques heat only and heat with vibration. However, at the apical third mean PGP was significantly higher ($p<0.05$) by heat with vibration technique than by heat only technique (Figure 1 and Figure 2). This indicates that the vibration effect on heated plugger is rather important than the plugger depth alone for better GP adaptation. Previous study also found the positive effect of ultrasonic vibration on adaptation of GP with the dye penetration test (Bailey et al., 2004). In the study of Baumgardner and Krell (1990), the teeth which were obturated using ultrasonically activated spreader showed less dye penetration leakage compared to obturation by manual spreader. Their SEM pictures also demonstrated that the ultrasonically condensed GP mass as more homogeneous with fewer void compare to manually condensed GP.

In the clinical study of Zmener and Banegas (1999), after obturation with ultrasonic vertical condensation 93% of recalled patients with preoperative radiolucent areas felt comfortable. These results probably due to the majorities of apical accessory canals were filled under ultrasonic condensation, in agreement with this study that showed higher mean PGP at the apical third level of the lateral canals using vibration technique (Table 1). Arguably, Weine (1984) study reported that the obturation technique is not an important factor for the lateral canal obturation. Barthel et al. (2004) reported that there is no correlation between unfilled lateral canals and periodontal lesion. In a contrary, the homogeneity of the root filling was associated with a lower frequency of periapical lesions and found that incompletely obturated root-filled teeth developed periapical lesions significantly more often than completely obturated root canals (Petersson et al., 1991). The results of present study showed apical third level of lateral canals (the most difficult level to fill in root canal system) were filled with higher mean PGP using heat with vibration technique.

Conclusion

The type of lateral canals in this study was artificially created. Most of the naturally existing lateral canals are not as straight as an artificial canal. However, within the limitations, the results of this study provided the percentage of GP penetration inside the lateral canals is higher when heat and vibration technique is used compared to heat only technique. Further studies looking forward the obturation on the lateral canals of narrow, taper, curve canal such as mesial root of mandibular molar teeth are recommended between heat only and heat with vibration techniques.

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Original Article

Does visual perception have more impact for effective learning in dental anatomy (Tooth carving practical session)?

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Abstract

Tooth carving practical sessions usually in wax are indispensable for the achievement of course objectives in teaching Dental anatomy to initiate and develop the psychomotor skills of the students which are really essential in forthcoming clinical years. This study was carried out in two consecutive first year dental batches, at school of dentistry, International Islamic University Malaysia and all together 90 students participated in it. The study design was a randomized controlled single blind cross-sectional interventional study. The students were randomly divided into two groups based on equal gender ratio and they were assigned to do the wax tooth carving of 11(permanent maxillary right central incisor). One group received conventional class room instructions from instruments handling to detailed carving procedure. The other group received verbal instructions for instruments handling and detailed carving procedure was displayed by a video clip developed by the Oral Biology unit. Both groups were allowed to do the carving for two hours exactly. The student performance was evaluated from the finished carved wax tooth models by giving the grades based on the resemblance to that particular natural tooth. Grading was scored by the expert and she was blinded that which group received video clip display on tooth carving demonstration. Better students' performance for general resemblance was found in the group where a video clip was displayed ($p < 0.05$). However, for the particular surfaces, the grades achieved for the mesial and distal surfaces were statistically significant ($p < 0.05$) only. Findings for the rest of the surfaces (labial, lingual, incisal) were not statistically significant ($p > 0.05$).

Introduction

Computer technologies have been used to enhance learning since the 1960s (Atkinson, 1968). Advancements in technology and greater acceptance by students have fostered its use in dental education (Rosenberg et al., 2003). Dental anatomy is the first subject in any dental or dental related course

which introduces the students to individual tooth morphology of human dentition which is heterodont (having different forms of teeth). Apparently it is the bridging course towards the clinical dentistry and computer assisted technologies are taking in place for teaching –learning process of dental anatomy subject including tooth carving practical session. Since dentistry is a blending of science and arts, manual skills are essential to be developed since from the beginning. WHO defined the dentistry as “the science and art of preventing, diagnosing and treating diseases, injuries and malformations of the teeth jaws and mouth”(DentalPedia™ The Dental Encyclopedia). When considering the use of computer technology in teaching dental anatomy, some variations were found among the following studies. Student perceptions of the effectiveness of computer-aided learning compared to conventional teaching vary (Rosenberg et al., 2005). Fouad and Burleson (1997) reported that students preferred using computer assistance for learning, but opinions differed on its effectiveness when compared with traditional teaching. Students in studies of Hobson et al. (1998) and McDonough and Marks (2002) felt that their educational needs were better served by a personal tutorial or face-to-face teaching rather than computer instruction. Other studies have suggested that students prefer technology as a supplement to traditional didactic sessions (Sandoval VA et al., 1987). Another study found similar satisfaction and educational results using either computer-aided or tutor-delivered teaching alone with no advantage of using them in tandem (Gega L et al., 2007). Anyway, reasons for these research variations may probably due to differences in subject matter, presentation mode of material, students' familiarity and comfort with computer technology, and differences in the ways students learning perception. As for teaching dental anatomy, tooth carving practical session usually in wax are essentially involved and it introduces the students with the knowledge of tooth structure, morphology and occlusion. It provides a knowledge platform to continue clinical dental education in the coming years. However such practical sessions usually need quite a number of lecturers to be involved. School of

Dentistry, Virginia common wealth university (2009) reported that use of an interactive computer program in teaching dental anatomy and morphology was as effective as teaching with traditional classroom lectures where the least human resource is necessary. Hence the better teaching modality of dental anatomy is really necessary for the better understanding of the subject with the minimal use of human resources. The present study was aimed to explore the better teaching modality in teaching dental anatomy tooth carving practical session specifically to compare the student's performance on the wax tooth carving specimen between the two groups; one was demonstrated by a video clip display and the other was demonstrated by the usual classroom instructions

Materials and methods

This study was conducted in the two consecutive batches of first year dental students. Students were invited to participate in the study and altogether 90 students participated. When they had been taught on terminology, landmark and morphology on maxillary right central incisor they were assigned to do wax carving on it. The measurements of the tooth size referred to Wheeler's Dental Anatomy Physiology and Occlusion 8th edition. The students were randomly divided into two groups based on equal gender ratio. The study design was a randomized controlled single blind cross-

sectional interventional study. The students were allowed two hours exactly for the carving procedure in their respective rooms simultaneously. One group received conventional class room instructions from instruments handling to detailed procedure. The other group received verbal instructions for instruments handling and detailed carving procedure was displayed by a video clip developed by the Oral Biology unit. Although most of the studies like this study allowed the repeated watching of the video clip, here we allowed the students watching once and which is one go only. Video clip was not allowed to stop or rewind. Students were supposed to watch the video clip till the end which took about half an hour. Only after that, students in this group were allowed to start the wax carving which is for 2 hours exactly. The student performance was evaluated from the finished carved wax tooth models by giving the grades based on the resemblance to that particular natural tooth. Grading was given by the expert and she was blinded that which group received video clip display teaching. The general resemblance to that particular natural tooth was graded as good, fair and poor resemblance. The grades were entered into the SPSS version and two groups were compared by using chi square test. Furthermore each and every aspect was given marks for the particular resemblance. Independent T test was used for the comparison of the marks obtained for each and every aspect.

The example steps for the carving of an incisor

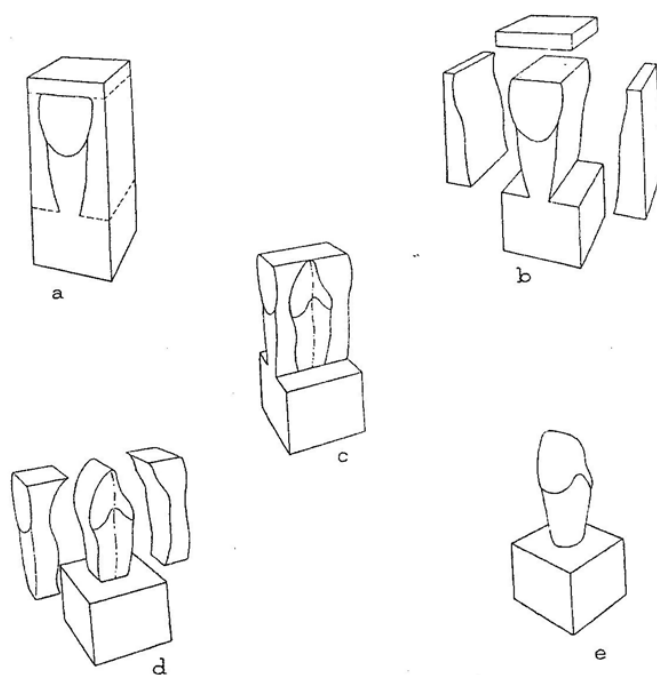


Figure 76. Method of blocking in a central incisor.

These steps referred to Wheeler's Dental anatomy Physiology And Occlusion text book.

The Dental anatomy Unit rubrics for the marking of detailed aspects are as follows;

1. Labial surface = 2marks Square outline of the crown
Mesioincisal angle- sharp
Distoincisal angle- rounded
Incisal ridge straight. + mamelons, perikymata
2. Lingual surface= 2 marks Crown and roots taper towards the lingual.
Cingulum, Marginal ridges, Incisal ridges
Lingual fossa (All are less prominent
compared with 12)
3. Mesial surface = 2 marks Triangular in shape.
Incisal ridge is on a straight line with the
root axis. CEJ curves more incisally. Height of contours are situated in the
Cervical third.
4. Distal surface = 2 marks Triangular in shape
CEJ is less curved incisally.
5. Incisal surface= 2 marks crown tapers towards the lingual.
Broad and flat labial outline.
Narrow and convex lingual outline made up
by cingulum. Incisal ridge is straight mesiodistally.

10 marks

Results

Better student performance for general resemblance was found in the group where a video clip was displayed ($p < 0.05$). However, for the particular surfaces, the grades for the mesial and distal surfaces only revealed statistically significant results ($p < 0.05$). Findings for the rest of the surfaces (labial, lingual, incisal) were not statistically significant ($p > 0.05$).

Discussion

For the general resemblance it was found that the students who received the video clip display demonstration on the detailed tooth carving procedure gained the better grade than the students who received the normal classroom teaching. However, for each and every detailed aspect only mesial and distal surfaces revealed the significantly better results. The rest of the results were not clinically significant. This may be probably due to the clearer vision for the proximal (mesial, distal) surfaces in the video clip display as the crown forms from these aspects are wedge shaped, with a cervical base and an incisal apex. The cutting strikes of the carvers (lecron, wax knife) for the proximal surfaces needed to go more in line with the line of vision. Hence it (anteroposterior direction) may not probably block

the viewer vision unlike rest of the surfaces where instrumentation needed to go more perpendicular to the line of vision. When the cutting strikes are running in the mesiodistal direction (horizontal direction) it will more or less block the vision in addition to that the wax block itself is small enough. These data suggested that the visual perception is very important for teaching learning process in dentistry. Bruner (1967) and Piaget (1990) describe how humans assimilate knowledge about their environment through four sensory modalities: visual (observing pictures, symbols, or diagrams), auditory (listening, discussing instructional material), visual/ iconic (reading and writing), and kinesthetic (using tactile sensory abilities such as smell and touch). As the teaching learning technologies are advancing, authors suggested to use any form of IT technology in teaching dental anatomy which may be interactive CD ROM, Computer assisted teaching, video clip and so on. We need to admit that there could be many confounding factors in this type of study. If this study could be done crossing for another tooth carving it would be more reliable. Moreover, if we could assess the student interest, satisfaction and motivation in this study it would be more informative. Hence it can be concluded that the visual perception has more impact on effective learning of dental anatomy tooth carving practical session.

Variable	n	Method one Freq (%)	Method two Freq (%)	χ^2 statistic ^b (df)	P value
Poor resemblance	43	27 (62.8)	16 (37.2)	8.10 (2)	0.017
Fair resemblance	25	13 (52.0)	12 (48.0)		
Good resemblance	23	6 (26.1)	17 (73.9)		

TABLE 1. STUDENT PERFORMANCE FROM TWO GROUPS

Variable	Method one N= 46 Mean(SD)	Method two N=45 Mean (SD)	Mean diff. (95%CI)	t statistic * (df)	P value
Labial aspect	1.1 (0.32)	1.5 (0.34)	-0.3 (-0.5, -0.2)	-4.5 (84.4)	0.261
Lingual aspect	1.1 (0.36)	1.5 (0.42)	-0.4 (-0.6,-0.2)	-4.7 (86.0)	0.253
Mesial aspect	1.0 (0.36)	1.3 (0.36)	-0.3 (-0.4, -0.1)	-3.7 (89.0)	0.041
Distal aspect	1.0 (0.33)	1.3 (0.23)	-0.3 (-0.4, -0.1)	-4.0(89.0)	0.013
Incisor aspect	1.0 (0.45)	1.34 (0.41)	-0.4 (-0.5, -0.2)	-4.1 (88.7)	0.673

TABLE.2 COMPARED MEAN SCORES FOR THE DETAILED ASPECTS

Conclusion

Use of video clip display, the teaching modality in which the least human resource is necessary resulted in better student performance for general resemblance and for particular resemblance on mesial

and distal surfaces of the carved wax tooth at least for permanent maxillary right central incisor and the visual perception has more impact on effective learning of dental anatomy tooth carving practical session.

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Original Article

A study on maximal biting forces of old and new complete dentures

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Abstract

Masticatory efficiency is one of the parameter in assessing the function of complete dentures. This study measured and analyzed maximal biting forces of old and new dentures during the transition period. The mean biting force of old dentures was lower (5.05 Kgf) than new dentures while the highest force (7.66 Kgf) was granted by new dentures after adaptation period. The mean maximal biting force (7.31 kgf) was noted at delivery time of new denture. The differences between the old dentures and new dentures were statistically significant at $p < 0.05$. The result showed that the differences in mean biting force measurement between the new denture at the time of delivery as well as after adaptation period were statistically significant at $p < 0.05$. The bite force measurement of denture wearers in this study was maximum at 9.10 kgf in new denture wearer after 1 month adaptation period and minimum at 3.71 kgf with old denture. The results of this study concluded that the masticatory efficiency increased significantly when the patient's old dentures were replaced with new dentures. New prostheses may need adaptation period for at least one month or more and masticatory efficiency improved after getting adaptation.

Introduction

Fabrication of complete dentures has had a long and successful history. The complete dentures were constructed to restore oral function, comfort, appearance and health of the edentulous patients. The comfort, efficiency, stability, retention and appearance of the dentures are all liable to become impaired with the long passage of time and patient may have to replace their existing dentures with new ones. Masticatory efficiency is one of the parameter in assessing the function of complete dentures. Masticatory efficiency can define the number of extra chewing strokes required by an impaired dentition in order to achieve the same degree of food pulverization as a norm while masticatory performance in terms of the percentage particle size distribution of food when chewed for a given number of strokes (Manly and Braley, 1950). Vinton and Manly (1955) stated

that during a 6 month period after the patients had received new dentures, no or only slight improvement of the masticatory ability was obtained. Lindquist and Carlson (1981) also found no improvement of chewing ability and chewing efficiency when patients with denture adaptation problems were treated with optimal new dentures. Gunne (1982) studied the masticatory efficiency of 19 complete denture wearers with their old and new dentures and no significant difference was noticed when patients changed from old to new dentures or during the first 18 months after insertion of new dentures. But another study of the same researcher in 1985 showed that masticatory efficiency and the subjective experience of masticatory performance increased significantly when the subjects were provided with new dentures, but no changes were found in the dietary intake (Gunne, 1985). Garrett (1996) pointed out that even 3 months after the insertion of new dentures the overall masticatory function did not reach the level of the old dentures. The researcher also stated that functional adaptation to new dentures may require more than a few weeks or months. In the study of Miyaura (2000), masticatory efficiency and the subjective experience of masticatory performance increased significantly when the subjects were provided with new dentures. Miyaura also commented that functional adaptation to new fixed and removable prostheses might require at least 1 month or more. Bite force measurement was found to be positively related to masticatory efficiency (Heath, 1982; Helkimo, 1977; Lindquist, 1986). Fontijn-Tekamp (2000) proved that a significant correlation was found between maximum bite force and chewing efficiency and nearly half of the variation in chewing efficiency was explained by bite force alone. The purpose of this study was to measure and analyze maximal biting forces of old and new dentures during the transition period.

Materials and methods

Twenty two poor fitting complete denture wearing patients attending the Department of Prosthodontics, University of Dental Medicine, Yangon for renewing their dentures during the study

period were selected. Maximal biting forces of old and new dentures were measured by using the bite force meter (Unipulse Digital Indicator F340A, NEC Sanei Instruments Ltd., Japan). Questionnaires were used to assess retention, chewing satisfaction, comfort and general satisfaction with old and new dentures.

Results

To measure the maximal biting forces of old dentures

and new dentures

The table 1 and 2 show that biting forces comparison of old and new dentures. The mean force of old denture (5.05 Kgf) was lower than new dentures (7.31 Kgf). The highest force (7.66 Kgf) was granted by new dentures after adaptation period. The difference between the old denture and new denture was statistically significant at $p < 0.05$.

Table 1. Maximal biting forces comparison in old and new dentures

	Old Denture	New denture (Delivery time)	New denture (After adaptation)
N	22	22	22
Mean	5.05*	7.31*	7.66**
Median	5.20	7.36	7.61
Std. Deviation	0.90	0.67	0.66
Minimum	3.71	6.30	6.50
Maximum	6.80	8.91	9.10

* $p < 0.001$ means significant difference between old and new denture

** $p < 0.05$ means significant difference between at the time of delivery and after adaptation of new denture

When comparison of maximum biting force at the time of delivery and after adaptation, there was significant improvement found after adaptation.

Questionnaires concerning patient satisfaction (Modified Smith's Method) (Smith, 1969)

(1) Retention	
Very retentive	2
Retentive	1
Poor retentive	0
(2) Chewing satisfactorily	
Very satisfied	2
Satisfied	1
Not satisfied	0
(3) Comfort	
Very comfortable	2
Comfortable	1
Uncomfortable	0
(4) General satisfaction	
Very satisfied	2
Satisfied	1
Not satisfied	0

Very satisfied - 6-8, Satisfied - 3-5, Not satisfied - 0-2

Table 2. Total patient satisfaction scores in old and new dentures

	Very satisfied (%)	Satisfied (%)	Not satisfied (%)	Total (no.)
Old dentures			22 (100%)	22
New dentures (At delivery)	22 (100%)			22
New dentures (After adaptation)	22 (100%)			22

It was found that all 22 new dentures were very satisfied at the time of delivery and also after adaptation.

Discussion

On studying the maximal biting forces of study dentures, measurements were done at first molar area on both habitual chewing side and non-habitual side for three times. Nyan (2003) stated that the maximal biting forces at first molar areas were significantly greater than those of first premolar areas and biting forces on habitual chewing side and those on the other side (non-habitual side) were not significantly different. Nakashima (2003) agreed with Nyan and also concluded that there was no statistically significant biting force difference between habitual and non-habitual chewing side of both dentulous and edentulous groups. So also in this study, highest score was taken from both sides irrespective of habitual chewing sides.

The mean biting force of old dentures was lower (5.05 Kgf) than new dentures while the highest force (7.66 Kgf) was granted by new dentures after adaptation period. The mean maximal biting force (7.31 kgf) was noted at delivery time of new denture. The differences between the old dentures and new dentures were statistically significant at $p < 0.05$.

On the other hand, Vinton and Manly (1955) stated that no or only slight improvement of masticatory ability was obtained after the patients had received new dentures. Lindquist and Carlsson (1981), Gunne (1982) and Garrett (1996) agreed with Vinton and Manly, that no significant differences when patients changed from old to new dentures at delivery time or during the first 18 months after insertion of new dentures. But another study of Gunne in 1985, masticatory efficiency and the subjective experience of masticatory performance increased significantly when the subjects were provided with new dentures.

Miyaura (2000) concluded that although

functional adaptation period was required, the masticatory performance increased significantly when the patients were provided with new dentures.

The difference in these researches might be due to difference in bite force measuring methods, different occlusal forms of artificial teeth, changes in vertical dimension, technical qualities of the dentures and age of the patients included in each study. There are many weakpoints in measuring the scores of masticatory performance by using sieve tests. The masticatory performance from the sieve test using test foods (eg. carrot, peanuts, etc.) are in proportionate to occlusal contact area of subject's dentures. Because of larger occlusal contact area of previous dentures due to attrition of artificial teeth than that of the new dentures, test foods may have been relatively easy to be chewed and so also there was no significant correlation between masticatory efficiency of old and new dentures. Another weakpoint is modulus of elasticity of the test foods. The lower the modulus of elasticity, the higher the masticatory performance, for example, peanut has a relatively low modulus of elasticity; their masticatory performance tended to high even on the denture with severe attrition (Ishikawa, 2007). Ishikawa also discussed that the test results using color changeable chewing gum was more conformed to subjective evaluating scores. By using bite force meter, it recorded peak measurement only and not associated with nature of test foods.

Bite force measurement was found to be positively related to masticatory efficiency (Heath, 1982; Helkimo, 1977; Lindquist, 1986). Fontijn-Tekamp (2000) proved that a significant correlation was found between maximum bite force and chewing efficiency and nearly half of the variation in chewing efficiency was explained by bite force alone. Therefore, the results of this study agreed with the Miyaura (2000), Murata (2002) and Hayakawa (2000 and

2003), significant improvement in chewing efficiency was found when the patients had changed their old dentures with new dentures ($p < 0.05$).

However, Boretti (1995) stated that in the case of complete dentures, the subjective criteria may be more important than the chewing tests. Thus questionnaires are effective tools in this regard. In this study, not only digital bite force meter but also questionnaires are used to assess the chewing efficiency with new dentures subjectively. Almost all patients got chewing satisfaction with their new dentures (Table 2).

The result of this study also showed that the differences in mean biting force measurement between the new denture at the time of delivery as well as after adaptation period were statistically significant at $p < 0.05$. It showed that the new dentures provided higher biting forces after adaptation. It was coincided with the study of Miyaura (2000) that functional adaptation to new fixed and removable prostheses might require at least one month or more.

It was found that bite force measurement of denture wearers in this study was maximum at 9.10 kgf and minimum at 3.71 kgf. Maximum biting force 9.10 kgf was found in new denture wearer after 1 month adaptation period while minimum 3.71 kgf was with old denture. Haraldson, Karlsson and Carlson (1979) stated that the maximal biting force of denture wearer was one-fifth or one-sixth of that of the dentate subjects. Meng and Rugh (1983) reported that the bite strength of complete denture wearers, being 21 to 37 lb, 29.3 lb average. Michael et.al. (1990) found that bite strength of natural dentition was 4.5 times greater than that of complete denture wearers. Morikawa (1994) stated that occlusal force during heavy clenching was 25.7 kgf.

In the study of Nyan (2003), it was found that the mean maximal biting forces at first premolar and first molar were 6.08 kgf and 8.85 kgf respectively. Kyu (2003) performed the bite force study among the Japanese complete denture wearers in Japan. It was found that mean maximal biting force at first premolar region was 6.71 kgf and at first molar region was 11.77 kgf. Nakashima (2003) also found that the average value of maximal occlusal force in complete denture wearers on the habitual side on the posterior teeth region measured by the Occlusal Force-meter was 74.67 N.

This study found that maximal biting force 9.10 kgf in new denture wearing patients after 1 month adaptation period. It was slightly reduced than that of the foreign studies (Meng and Rugh, 1983; Nakashima, 2003; Kyu, 2003), but coincided with results of Myanmar research (Nyan, 2003). It may be only due to different ethnicity, different food intake and different masticatory pattern. The researcher considered that it may not be due to the quality inherited by the dentures but it ought to consider about the types of articulator and types of occlusion used in denture fabrication.

Conclusion

Within the limitation of this study, it can be concluded that the maximal biting forces increased significantly when the patient's old dentures were replaced with new dentures. The results of this study revealed that the masticatory efficiency increased significantly when the patient's old dentures were replaced with new dentures. New prostheses may need adaptation period for at least one month or more and masticatory efficiency improved after getting adaptation.

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Original Article

Correlation between sulcular and capillary blood glucose levels in periodontal patients by using glucometer

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Abstract

By the close interrelationship between diabetes mellitus and periodontal disease, the dental practitioners and especially the periodontists are extremely likely to encounter an increasing number of undiagnosed diabetic patients with periodontitis. Identification of the dental patient with diabetes is important for the dentist to recognize the level of severity and complications from diabetes and consequently manage the patient accordingly. The aim of the study is to correlate the sulcular and capillary blood glucose levels in periodontal patients by using glucometer. This study was carried out among sixty-five periodontal patients with no known history of diabetes mellitus. The random sulcular and capillary blood glucose levels also with modified gingival index were studied. Fasting blood glucose level was measured in cases of more than 200mg/dL in random capillary blood glucose level. In this study, there was statistically highly significant correlation between sulcular and capillary blood glucose levels regardless of gender, age, oral hygiene status and presence or absence of history of diabetes mellitus where $r=0.963$ and $p<0.001$ according to Pearson correlation. Although the difference between mean sulcular and capillary blood glucose levels in this study was 21mg/dL, the lowest and the highest difference were 1mg/dL and 91mg/dL respectively. Because of the wide variation among individuals in this study, the use of sulcular blood alone for diagnosing diabetes during routine periodontal examination is not recommended as a valid method. But sulcular blood glucose testing can be used as a pretest for determination of emergency blood glucose levels in susceptible persons with severe gingival inflammation during routine periodontal examination without puncturing the finger-tip, though confirmatory blood glucose tests are required later.

Introduction

Diabetes mellitus is one of the most common diseases over the world. WHO has estimated the prevalence of diabetes mellitus in Myanmar as

2.4 percent in 1995 and 2.5 percent in 2000. It was projected to be 3.2 percent in the year 2025 (Health statistics report, 2006-2011).

Diabetes, being a major non-communicable disease, claims a major burden on health care cost. This high health care cost is partly related to the complications associated with diabetes as well as the control of diabetes (WHO, 1999). The five classic complications of diabetes include micro-angiopathy, nephropathy, neuropathy, macrovascular complications and delayed wound healing. Loe (cited in Reeves) described that periodontal disease has been recognized as the sixth major complication of diabetes. Diabetics are more likely to develop periodontal disease than non-diabetics (Papapanou, 1996) and the disease severity is related to the duration of diabetes (Thorsteusson and Hugoson, 1993).

Even in industrialized countries, nearly half of the cases are undiagnosed. Diabetes UK (cited in Reeves) claimed that the average sufferers has had diabetes from between nine and twelve years before doctors diagnose the condition. Expert Committee on the Diagnosis and Classification of Diabetes mellitus (cited in Beikler and co-workers) reported that patients with undiagnosed diabetes are at significantly increased risk for coronary heart disease, stroke, and peripheral vascular disease.

Metabolic control in a diabetic patient can be measured at a single time point from blood sugar or glucose level. The glucometer is one of the most popular and non-invasive means for this purpose. Parker et al (1993) have described the use of a small plastic pipette for in-office blood glucose testing of gingival crevicular blood and have shown this technique to be significantly correlated to venous blood values. Sulcular bleeding is a normal consequence of periodontal examinations due to inflammation of the tissues regardless of whether the patient is diabetic or not. Considering 50% of diabetics remain undiagnosed, testing sulcular blood glucose may provide a suitable method

for identifying potential diabetic patients during routine dental visits since there is a correlation with capillary blood. Appropriate referral to a physician can then be made when warranted. Estimation of sulcular blood glucose levels in routine periodontal examination procedure can be used as non-invasive means for detection of blood glucose level instead of using capillary blood (Ardakani M et al, 2009).

The American Diabetes Association (cited in Allerdig) recommended that all individuals over the age of 45 who have at least one major risk factor for type 2 diabetes be tested every three years. For those with more than one risk factor, testing should begin earlier and be performed more often. The early diagnosis of diabetes, however, might help to prevent its long-term complications that are responsible for the high morbidity and mortality of diabetic patients (Harris & Eastman, 2000).

A crucial aspect of the identification of the dental patient with diabetes is the ability of the dentist to recognize the level of severity and complications from diabetes and consequently manage the patient accordingly (Little, 2002). In this study, the correlation between sulcular and capillary blood glucose levels in periodontal patients by using glucometer was studied.

Materials and methods

Both genders of 65 patients attending at the Department of Periodontology, University of Dental Medicine (Yangon) were studied. Patients with the age

of 45 years and above who had gingivitis at anterior region (irrespective of probing depth and modified gingival index score 2, 3 or 4) were included. Patients with hematological disorders, thyroid disorders, long-term use of β -blockers, quinine, prednisolone, non-steroidal anti-inflammatory drugs and thiazide diuretics were excluded. Patients who had taken antibiotics within one week, known diabetic patients and the area with suppuration were also excluded.

Spirit swab was applied to the area for testing capillary blood glucose. The capillary blood glucose level was recorded. Prior to probing, all subjects had to rinse with 0.12% chlorhexidine. Moisture isolation was done with cotton and air drying. The periodontal probe was inserted into the pocket of selected tooth. Blood oozing from the gingival tissues was drained into the specific strip test measuring area (Medisafe-Blood Glucose Monitoring System, Terumo, Japan). The sulcular blood glucose level was recorded. The modified gingival index score of the patient was recorded. Confirmatory fasting blood glucose test was done in cases of increased capillary blood glucose ≥ 200 mg/dL. Samples for fasting blood glucose level were also taken from capillary blood. Appropriate referrals to a physician were made when warranted.

Results

In this study, sulcular and capillary blood glucose levels were examined from 28 male (43.1%) and 37 female (56.9%) patients. Statistical analysis was done by SPSS (Statistical Package for Social Science) software version 16.0 and statistical significant difference was observed if p value was less than 0.05.

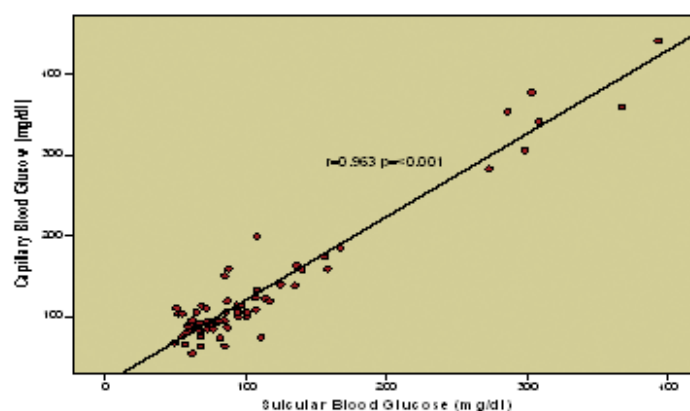


Figure- 1 Correlation between sulcular and capillary blood glucose levels

Figure (1) showed the correlation between sulcular and capillary blood glucose levels of this study. There was highly significant correlation between sulcular and capillary blood glucose levels in this study ($r=0.963$ and $p<0.001$).

Table -1 Descriptive statistics of respondents

	Minimum	Maximum	Mean $\pm$ SD
Age (in years)	43	72	54.1 $\pm$ 8.3
Frequency of tooth brushing (in number)	1	5	1.8 $\pm$ 0.6
SBGL (mg/dl)	50	393	111.6 $\pm$ 78.3
CBGL (mg/dl)	54	442	132.0 $\pm$ 84.1

Table -2 Incidence of Diabetes Mellitus in the participants

	Frequency	Percent	Valid percent	Cumulative percent
DM (-)	58	89.2	89.2	89.2
DM (+)	7	10.8	10.8	100.0
Total	65	100.0	100.0	

Table (2) showed incidence of diabetes mellitus in the participants in the study. The 7 participants (10.8%) in this study were diagnosed as diabetic patients.

Table -3 Comparison of SBGL among three different groups of gingival index score

Modified Gingival Index Score	N	Mean SBGL (mg/dl)	F	p value
2	15	98.5	6.642	*0.002
3	36	93.0		
4	14	173.8		

Table -4 Comparison of CBGL among three different groups of gingival index score

Modified Gingival Index Score	N	Mean CBGL (mg/dl)	F	p value
2	15	129.1	4.59	*0.014
3	36	111.6		
4	14	132.0		

Table (3) and table (4) showed comparison of sulcular and capillary blood glucose levels among three different groups of gingival index score which are statistically significant ($p=0.002$ and $p=0.014$ respectively).

Table-5 Correlation between sulcular and capillary blood glucose levels (GI score 2)

Parameters	N	r (Spearman correlation)	P
SBGL& CBGL(GI 2)	15	0.569	* 0.027

Table-6 Correlation between sulcular and capillary blood glucose levels (GI score 3)

Parameters	N	r (Spearman correlation)	P
SBGL& CBGL(GI 3)	36	0.950	* 0

Table-7 Correlation between sulcular and capillary blood glucose levels (GI score 4)

Parameters	N	r (Spearman correlation)	P
SBGL& CBGL(GI 4)	14	0.967	* 0

*If $p < 0.05$ = statistically significant, $p < 0.01$ = highly significant, $p < 0.001$ = very highly significant

Table (5) showed the correlation between sulcular and capillary blood glucose levels in patients of modified gingival index score 2 which is statistically significant ($p = 0.027$) according to Spearman correlation. Table (6) showed the correlation between sulcular and capillary blood glucose levels in patients of modified gingival index score 3 which is statistically very highly significant ($p = 0$) according to Pearson correlation. Table (7) showed the correlation between sulcular and capillary blood glucose levels in patients of modified gingival index score 4 which is statistically very highly significant ($p = 0$) according to Pearson correlation.

Discussion

According to ADA recommendation, this study was carried out among sixty-five cases of periodontal disease with no known history of diabetes mellitus.

There was highly significant correlation between sulcular and capillary blood glucose levels collected in this study where $r = 0.963$ and $p < 0.001$. This finding of the present study is consistent with the most of previous studies of Ching Zong Wu et al (2008), Ardakani M et al (2009), Rufus Brown (2010), Mocanu RE and Mârju S (2010) on correlation between sulcular and capillary blood glucose levels.

In this study, both mean gingival and capillary blood glucose levels of modified gingival index score 4 (severe inflammation) were higher than those of modified gingival index score 2 (mild inflammation) and score 3 (moderate inflammation). Higher glucose levels may be detected in gingival crevice fluid at periodontally diseased sites as compared to healthy sites (Ciantar M, Spratt DA, Newman HN, Wilson M, 2002). These findings were also consistent with the present study.

There were 7 (10.8%) participants in this study whose capillary blood glucose levels > 200 mg/dL and their fasting blood glucose levels > 126 mg/dL and sulcular blood glucose levels (> 200 mg/dL) at that time of measuring capillary blood glucose levels. They were diagnosed as diabetes mellitus and

referred to Thingangyun Sanpya Hospital for medical consultation.

Out of seven diabetic cases, one of the patients exhibited modified gingival index score 2 and one of the patients exhibited modified gingival index score 3 and five patients exhibited modified gingival index score 4. These findings of the present study were also consistent with the statement of Almas (2001) (cited in Ardakani, 2009) in which the severity of periodontal disease is directly associated with the blood glucose level.

Although there was statistically highly significant correlation between sulcular and capillary blood glucose levels, the reasons for no recommendation in clinical use as a valid method are:

1. Although the difference between mean sulcular and capillary blood glucose levels in this study was 21mg/dL which was consistent with the previous studies. The difference between sulcular and capillary blood glucose levels was widely varied among individuals in this study. The lowest and the highest difference were 1mg/dL and 91mg/dL respectively.
2. There was no definite numerical difference between sulcular and capillary blood glucose levels among three different groups of gingival index score although the higher in modified gingival index score, the narrower in gap between sulcular and capillary blood glucose levels.
3. Such variation in the difference between sulcular and capillary blood glucose levels may be due to the errors in reading of the glucometer and the test tips such as storage and expired date.
4. There were many limitations to obtain an acceptable blood sample from gingival sulcus such as site in the oral cavity, degree of gingival inflammation.

Additional studies that refine this technique and use of larger sample size were recommended for

the use of sulcular blood in measuring blood glucose level in clinical practice instead of capillary blood. These findings were also consistent with the previous studies.

The reason for disagreement on using gingival crevicular blood for testing blood sugar during routine periodontal examination was contamination and dilution of gingival crevicular fluid containing low levels of glucose in the tiny blood sample, leading to profound underestimation of glucose concentration and/or rendering measurements unreliable(H.-P. Müller and E. Behbehani, 2004). Khader, Y., Al-Zu'bi, B., Judeh, A. and Rayyan, M. (2006) suggested that the technique to obtain an acceptable blood sample from gingival crevices was not always feasible which would limit its application as a clinical practice. Strauss, S.M., et al (2009) proposed that gingival crevicular blood samples were suitable to screen for diabetes in persons with sufficient bleeding on probing (BOP) to obtain a sample without touching the tooth or gingival margin (i.e., in patients having the basic clinical signs of gingivitis or periodontal disease).

Though confirmatory blood glucose tests are required later, sulcular blood glucose testing can be used as an emergency blood glucose test in persons with severe gingival inflammation during routine periodontal examination without puncturing the finger-tip. The reason why is based on the evidence came out from this study. Rufus Brown (2010) proposed that the capillary and gingival crevicular blood glucose levels were higher in diabetes and

severe periodontitis. He also suggested that though capillary/ venous blood glucose samples used for diabetes mellitus screening is gold standard, the gingival crevicular blood may prove to be promising approach for routine dental office screening for diabetes mellitus in periodontal patients.

Conclusions

Although the difference between mean sulcular and capillary blood glucose levels in this study was 21mg/dL, the lowest and the highest difference were 1mg/dL and 91mg/dL respectively. The differences between sulcular and capillary blood glucose levels were widely varied among individuals in this study. Therefore, the use of sulcular blood alone for diagnosing diabetes during routine periodontal examination is not recommended as a valid method. But sulcular blood glucose testing can be used as a pretest for determination of emergency blood glucose levels in susceptible persons with severe gingival inflammation during routine periodontal examination without puncturing the finger-tip, though confirmatory blood glucose tests are required later.

Dental surgeons ought to participate in early diagnosis of diabetes mellitus along with oral health care. We, dental surgeons should explore the suitable methods for identifying potential diabetic patients during routine dental visits.

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Original Article

Assessment of Oral Health Status and Awareness of Dental Problems among Young Female Adults

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Abstract

The aim of the study was to assess the oral health status and awareness of dental problem among young female adults. A total of 294 (147 teachers from Thingungyun Teacher's Training College and 147 factory workers from North Okkala and South Dagon Townships, Yangon Division) participated in the study in which data concerning oral hygiene and dental visit behavior, oral health status and awareness were measured. A descriptive, cross-sectional, community-based, non-intervention type study design was used. Concerning oral hygiene behavior, most of them reported that brushing two times per day (82.3% of teachers and 78.2% of factory workers) and three minutes brushing (49.0% and 49.7%). However, they did not have knowledge of right time (56.5% of teachers and 76.9% of workers) and 6.1% and 43.5% reported they brushed horizontally. So, study population may have fair oral health knowledge. Regarding with awareness score, teachers scored two times higher than that of factory workers (6.51 vs. 3.76). No statistical differences were found between two groups relating to clinical data, mean DMF-T 0.91 vs. 1.27, caries prevalence 35.4% vs. 44.2% and MNS for calculus 3.26 and 3.67 in teachers and factory workers respectively. There was significant relationship between oral health awareness and periodontal disease but not with dental caries. There was very weak negative correlation between awareness score and DMF-T was observed among the factory workers.

Introduction

Oral health has been clearly shown to be one of the most important factors that are responsible for general health and well-being. Good oral health knowledge and awareness contributes to good oral health behavior, which in turn results in good oral health status (Abidin, 2005). This awareness naturally reflects peoples' own experiences, cultural

perceptions, familial beliefs and other life situations and strongly influences the oral health behavior.

There have been dramatic changes in the relative and absolute numbers of young adults in the world population. The increase in the young adult population relative to the total population is now leveling off (WHO, 1993). Thus, improving the health of young adult plays an essential role in improving the public health. Young adult is a person between the ages of 18 and 30 (Boeree, 2006). It is a crucial period of transition with personal responsibility for preventing dental disease beginning at this age and determining future oral health. The changes occurring during that period have important implications for health as well as oral health (NAHIC, 2005). Therefore, assessing the oral health awareness, periodontal status and dental caries status of young adult becomes essential in oral health care management (Sharda, 2009).

It is young women who bear the largest burden of disadvantage although both young women and young men in many parts of the world suffer from the consequences of underdevelopment (WHO, 1993). For women not only have their own special health problems related to pregnancy and childbirth, but customarily do most of the caring for their families. So if they are ignorant, malnourished and overworked, the health of their families as well as their own health will suffer (WHO, 1985). Improved health of women provides the key to their equitable and effective participation in overall socioeconomic development of the nation.

In Myanmar, the study on oral health status and need, awareness of dental problems among female teachers from Teacher Training College was conducted by Thaw et al in 1997. That study was based on assessment of female teachers only. Thus it is considered to be interesting and beneficial to study the comparison of the oral health status and awareness of dental problems between teachers and factory workers. This is because a teacher is in a unique

position to provide the guidance and motivation necessary to assist her students in establishing effective oral care habits that will benefit them throughout their lives. This opportunity will provide a new focus in the development of a health education partnership (Ontario Association of Public Health Dentistry, 2000). Meanwhile, the factory workers may have low standard of living, poor personal hygiene habits and financial instability that all are predisposed to oral diseases (Shaikh, 2011). The oral health of them is crucial since healthier workers are less absent, more productive and less likely to leave. So it is merit to assess and compare the oral health status and awareness of these two groups.

Materials and Methods

A descriptive, cross-sectional, community-based, non-intervention type of study was used in this study. The study period was from October, 2009 to October, 2010. This study was carried out in Thingungyun Teacher's Training College and two garment factories located in South Dagon and North Okkala Townships, Yangon Division with the permission of the principal of the College and the owners of the factories. Total samples were 294 (147 teachers and 147 factory workers). The convenience type of cluster sampling method was used to select factories and school. All eligible young female adults with inclusion criteria were contacted and consented. Teachers and workers who have dentofacial anomalies and those with severe medical conditions were excluded.

Concerning with oral health behavior, oral hygiene practices, oral hygiene habit after meal and dental visit behavior were explored using questionnaires. Oral health awareness questions such as actions taken for relieving the symptoms of dental problems, actions on signs of tooth decay and gum bleeding, idea about the impact of oral health on general health and information about Fluoride, Dental floss and Mouth wash were included in the questionnaire (Total – 10 marks).

After getting consent, about 50 participants were to answer in a prepared separate room like an examination at one time (Supervised questionnaire method). The examiner explained detail of each question and how to score and all participants were asked to answer instantly and submit back after completing the questionnaires. The examiner was always available during the completion of the questionnaires and the participants were to be encouraged to approach the examiner whenever they

needed clarification of any point.

Oral health status (dentition status and community periodontal status, CPI) of all participants were assessed using WHO (1997) criteria. Clinical examinations were performed under natural day light by the examiner and 2 trained recorders using disposable examination set and sterilized CPI probe for each individual. After clinical data collection, oral health education concerning correct oral hygiene measures and dietary advices were given. Any necessary treatment was given at the site of survey and at University of Dental Medicine, Yangon.

Collected data were cleansed and entered in Statistical Package for Social Science (SPSS) (version 16.0) and analyzed. The continuous variables were expressed by the means and standard deviations and analyzed by student's t test and correlation whereas the categorical variables were described by frequencies and percents and analyzed by chi-square statistics.

Results

The mean age of the teachers was 21.53 (standard deviation) (± 2.45) and that of the factory workers was 23.28 (± 4.52). Concerning with the educational status, all teachers had completed high school education and most of the factory workers (45.6% and 40.1%) had completed primary and middle school education respectively (Table 1). Oral health behaviour findings demonstrated teachers might have better oral health knowledge and practice than factory workers (more apparent in time and method of tooth brushing) (Table 2). Most of the participants (74.8% of teachers and 82.3% of factory workers) have never taken dental treatment. Among those who took dental treatment, almost all of them consulted with dental surgeon and major complaint was toothache (Table 3).

Mean oral health awareness score of teachers was nearly two times higher than that of the factory workers (6.51 vs. 3.76) (Table 4). No statistical difference was observed in both dental caries and periodontal disease data between teachers and factory workers (Table 5 and 6). Among teachers, only the prevalence of periodontal disease was related with the oral health awareness level whereas statistical association was observed between level of awareness and periodontal status among factory workers (Table 7 and 8). Very weak negative correlation between awareness score and DMF-T was observed among factory workers (Table 9).

Table 1. Educational status of young female adults (n = 294)

Educational status	Teachers (%)	Factory workers (%)
Illiterate	0 (0)	1 (0.68)
Primary school education	0 (0)	11 (7.48)
Completed primary school education	0 (0)	67 (45.6)
Complete middle school education	0 (0)	59 (40.1)
Completed high school education	147 (100)	3 (2.04)
Graduated	0 (0)	6 (4.08)
Total	147 (100)	147 (100)

Table 2. Oral hygiene behavior of young female adults (n = 294)

Oral hygiene behavior	Teachers (%)	Factory workers (%)
Frequency of tooth brushing (Twice per day)	82.3	78.2
Time of tooth brushing (After breakfast + Before going to bed)	43.5	23.1
Duration of tooth brushing (3 minutes)	49.0	49.7
Method of tooth brushing (Vertical + Horizontal)	75.5	41.5

Table 3. Reasons for visiting a dental surgeon of young female adults (n = 63)

Reasons for visiting	Teachers (%)	Factory workers (%)
Toothache	19 (12.9)	17 (11.6)
Swelling of gum	3 (2.0)	6 (4.1)
Caries	18 (12.2)	10 (6.8)
Cellulitis	1 (0.7)	1 (0.7)
Crowding	2 (1.4)	1 (0.7)
Regular check up	1 (0.7)	0 (0)
Trauma and crown fracture	2 (1.4)	2 (1.4)
For extraction	4 (2.7)	2 (1.4)
For replacement of missing	2 (1.4)	1 (0.7)
Presence of calculus	5 (3.4)	1 (0.7)
Eruption of last molar	1 (0.7)	3 (2.0)
Cannot chew properly	1 (0.7)	1 (0.7)

Table 4. Awareness score of young female adults (n = 294)

Awareness score	Teachers	Factory workers
Mean (SD)	6.51 ($\pm$ 1.64)*	3.76 ($\pm$ 1.95)*
Range	2-10	0-8

*p<0.001, Independent sample t-test (Very highly significant)

Table 5. Dentition status of young female adults (n=294)

Dental caries	Teachers	Factory workers
Mean DMF-T (SD)	0.91 (± 1.49)*	1.27 (± 2.09)*
Prevalence	35.4%**	44.2%**

*p>0.05, Independent sample t-test (Not significant)

**p>0.05, Chi-square test (Not significant)

Table 6. Periodontal status of young female adults (n=294)

Periodontal disease	Teachers	Factory workers
MNS for calculus (SD)	3.26 (± 2.11)*	3.67 (± 2.23)*
Prevalence	78.9%**	84.4%**

*p>0.05, Independent sample t-test (Not significant)

**p>0.05, Chi-square test (Not significant)

Table 7. Relationship between oral health awareness and oral health status of teachers (n = 197)

	Awareness level	
	High (>5.13)	Low (<5.13)
Mean DMF-T (SD)	1.02 (± 1.61)*	0.59 (± 0.99)*
Prevalence of dental caries	36.4%**	32.4%**
MNS for calculus (SD)	3.12 (± 2.22)**	3.68 (± 1.72)**
Prevalence of periodontal disease	73.6%***	94.6%***

*p>0.05, Independent sample t-test (Not significant)

**p>0.05, Chi-square test (Not significant)

***p>0.05, Independent sample t-test (Not significant)

****p<0.01, Chi-square test (Highly significant)

Table 8. Relationship between oral health awareness and oral health status of factory workers (n = 197)

Awareness level	High (>5.13)	Low (<5.13)
Mean DMF-T (SD)	1 (± 1.95)*	1.35 (± 2.13)*
Prevalence of dental caries	30.3%**	48.2%**
MNS for calculus (SD)	2.12 (± 2.41)**	4.11 (± 1.96)**
Prevalence of periodontal disease	54.5%***	93.0%***

*p>0.05, Independent sample t-test (Not significant)

**p>0.05, Chi-square test (Not significant)

***p<0.001, Independent sample t-test (Very highly significant)

****p<0.001, Chi-square test (Very highly significant)

Table 9. Correlation between awareness score and DMF-T

	Total sample	Teachers	Factory workers
Correlation (r value) (p)	-0.04 (0.48)	0.09 (0.26)	-0.19 (0.03)*

Discussion

Awareness, according to Thesaurus, is consciousness, understanding and responsibility. One of the determinants of awareness is educational status. In this study, comparison of oral health status and awareness is carried out between two different female groups, i.e. school teachers and factory workers.

According to the collected data, all school teachers, who are the trainers from Thingungyun Education College, completed high school education. However, 85.7% of factory workers just completed primary and middle schools (Table 1). In oral hygiene behavior, it can be seen that, the frequency and duration of tooth brushing, the unreliable answers might be replied, the comparison between those two groups have given non-significant results. Nevertheless, some behaviors which need true performance are necessary, such as time and method of tooth brushing, showed significant difference. Behavior reflects the awareness (Table 2).

Concerning with oral health status, it can be noticed non-significant different between dentition and periodontal status of both groups of young female adults (Tables 5 and 6). In tables 7 and 8, it showed the relationship between oral health status and awareness, of school teachers and factory workers. Those tables indicated that difference between oral health awareness and mean DMF-T, prevalence of dental caries and mean number of sextant (MNS) of both groups were non-significant, except prevalence

of periodontal status which showed highly significant different. The same result can be seen in table 9, which showed poor agreement in correlation between awareness score and DMF-T.

Although difference between awareness score of teachers and factory workers is very high in this study (Table 4), it might be due to the adequate knowledge, and do not exceed furthermore, such as attitude and practice, among the school teachers.

Similar effect can be seen in the treatment need. Among the categories of treatment needs, the majorities of subjects are involved in the normative or professional need. Tables 3, 5 and 6 showed that almost all of the female subjects of both groups, visited clinic due to their suffering i.e. expressed need or demand, except only one subject in school teachers, who answered that she visited dental clinic for regular checkup.

Conclusion

In this study, it can be concluded that teachers, whose educational status is higher than factory workers, have better oral health behavior. However, although awareness of teachers is higher very significantly than factory workers, both dentition and periodontal status of the study groups do not show significant difference. It proves that overall teacher's awareness is not completed. At the same time, both groups use to visit dental clinic only in expressed need.

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Original Article

Maturational evaluation of ossification of the mid-palatal suture

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Abstract

The correlation of the status of the mid-palatal suture on occlusal films with the skeletal maturity indicators assessed by means of hand-wrist films will be helpful in orthodontic treatment planning. The purpose of this investigation was to determine whether a positive correlation exists between adolescent skeletal maturational development and the approximation of the mid-palatal suture. Fifty-three Myanmar subjects aged 8 to 18 years participated in this study. Hand-wrist radiograph and standard occlusal radiographs of these subjects were taken and assessed for the skeletal maturity according to skeletal maturation assessment (SMA) system of Fishman (1982). Percentage of fusion of mid-palatal suture was evaluated with standard occlusal radiograph by using image J software. Then, the maturational stages in hand-wrist and mid-palatal suture were correlated. Highly significant association was observed between Skeletal Maturity Indicators (SMI) stages and percentage of fusion of mid-palatal suture. Correlation coefficient was found to be highly significant ($p < 0.001$). The result of the study indicated that the mid-palatal suture maturation and hand wrist skeletal maturation was significantly related.

Introduction

Human growth is characterized by considerable variation in the rate of progress of different persons towards physiologic maturity. It is one of the most myriad variations in nature and plays an important role in the etiology of malocclusion and also in evaluation of diagnosis, treatment planning, retention and stability of any case. Growth prediction can be assessed by using physiological parameters such as peak growth velocity in standing height, pubertal markers (secondary sex characteristics), dental development and tooth eruption, skeletal maturation of the hand-wrist, and skeletal maturation of the cervical vertebrae etc.

Skeletal maturation staging from radiographic analysis is a widely used approach to predict timing of pubertal growth, to estimate the proportion of growth

remaining. Skeletal age is considered to be the most reliable age for assessment of growth for orthodontic purposes. There are many regions normally used for skeletal maturational assessment (e.g. skull, cervical vertebrae, hand-wrist, elbow, femur, knee, ankle etc.).

Hand-wrist radiographic evaluation is one of the diagnostic tools currently available to determine whether the pubertal growth has started, is occurring or has finished. A radiograph of the hand and wrist provides a view of some 30 small bones, all of which have a predictable sequence of ossification. Although a view of no single is diagnostic, an assessment of the level of development of the bones in the wrist, hand, and fingers can give an accurate picture of the skeletal development status.

Assessing the skeletal maturation by reading hand-wrist has been the most popular and accurate means used by the orthodontists. Although the positive correlation exists between sesamoid bone ossification stages and development of mandibular canine, the stage of mandibular canine cannot estimate the sesamoid bone stage and cannot predict the onset of puberty. Furthermore, maturational patterns of tooth development have shown that males tend to be more advanced as compared with females in relation to skeletal maturity stages. Moreover, additional radiation exposure is required. Due to concern about the radiographic exposure that patients undergo to produce the necessary orthodontic documentation and also deterred by the costs involved, some practitioners tend to reduce the number of radiographs. Due to this concern, the use of the structures typically present in radiographs that are part of routine orthodontic documentation has been undertaken.

Standard occlusal radiograph is one of the dental radiographs used in Dentistry for some diagnostic purposes. By means of the standard occlusal view, the level of approximation of the mid-palatal suture can be assessed. However, the evidence on the correlation of the status of the mid-palatal suture on occlusal films with the skeletal maturity indicators assessed by means of hand-wrist

films is still lacking. If there is a strong correlation between these two parameters, it will be helpful to use the level of approximation of the mid-palatal suture as a maturational indicator in orthodontic treatment planning. The ease of recognizing sutural maturational stage, together with availability of intraoral radiograph in most dental practice, are practical reasons for attempting to assess physiologic maturity without taking hand-wrist radiographs.

A comparative radiographic evaluation of developmental stages of mid-palatal suture and hand wrist bones is undertaken among Myanmar population in this study.

Materials and Methods

The subjects with no previous history of trauma or injury to the face and hand-wrist region were selected in this study. Dental X-Ray equipment, lead apron, 8 inches × 10 inches films and 6 cm × 8 cm occlusal films, cassette, X-Ray viewers, a digital camera and Image J software were used.

Both the standard occlusal radiograph and the hand-wrist radiograph of each subject were taken by using dental x-ray equipment on the same record date by the same technician. Standard precaution was used to prevent unnecessary radiation exposure to subjects and radiographer. The film was processed according to the standard procedures. Eight inches × ten inches films for hand-wrist radiographs and 6 cm × 8 cm occlusal films for standard occlusal radiographs were used.

For hand-wrist radiograph, postero-anterior (PA) view of hand was taken. Patient was instructed to wear lead apron and seat at the end of table with elbow flexed about 90° with hand and forearm resting on table. Patient's hand was pronated with palmar surface in contact with cassette. Long axis of the hand and forearm was aligned with long axis of portion of film being exposed and the fingers spread slightly.

The central ray was perpendicular to film directed to the third metacarpo-phalangeal joint. The distance between the skin and focal spot was 100 cm.

For standard occlusal radiograph, the patient was seated with the head supported and with the occlusal plane horizontal and parallel to the floor. The film packet, with the white surface facing uppermost, was placed flat into the mouth on to the occlusal surfaces of the lower teeth. The patient was asked to bite gently. The film packet was placed centrally in the mouth with its long axis crossways in adults and anteroposteriorly in children. The X-ray tubehead was positioned above the patient in the midline, aiming downwards through the bridge of the nose at an angle of 65° - 70° to the film packet. The distance between skin and focal spot was 20 cm.

Determination of ossification stages

All radiographs were viewed on the X-ray viewer. Stages of ossification of the hand-wrist region were recorded according to the Fishman's system of skeletal maturation assessment (SMA system) (Figure 3) and compared with the amount of approximation of the midpalatal suture.

Determination of fusion of mid-palatal suture

To measure the length of mid-palatal suture on the standard occlusal radiograph, measuring software, image J was used. The key landmarks and planes were identified: Point A, most anterior point of the premaxilla, Point B, most posterior point on the posterior wall of the incisive foramen; and Point P, point on the line tangent to the posterior walls of the greater palatine foramen. Then, total length of suture (A-P) and amount of fusion (approximation) were measured (Figure 1.B). Those measurements were saved in Microsoft excel and calculated for percentage of fusion. All were measured for three times by two examiners.

Results

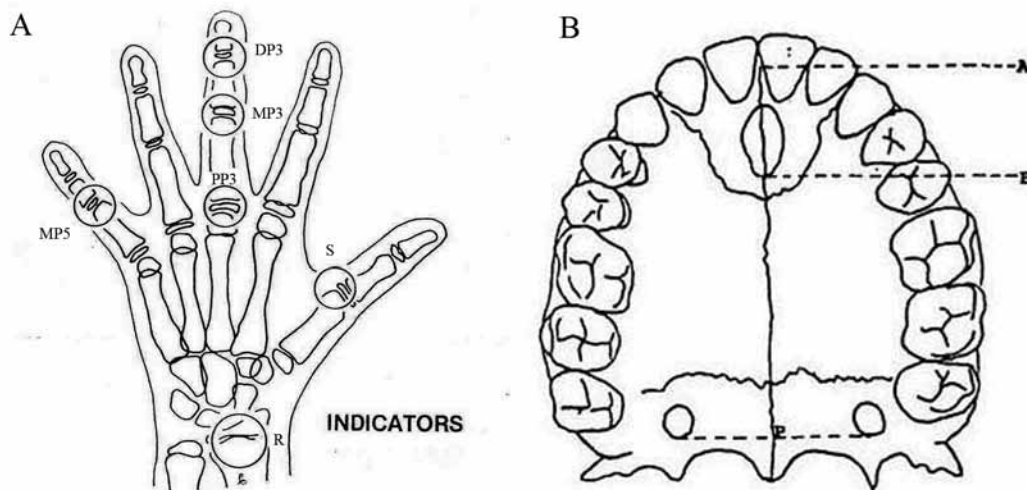


Figure 1.A. Sites of maturity indicators
1.B. Key landmarks on the mid-palatal suture

Very little mid-palatal approximation existed during early maturational stage (SMI 0 and 1). Fusion (approximation) was only less than 25 % in early SMI stages. In SMI 4 and 5, fusion was in the range of 25 - < 30%. In the stages of SMI 6, 7 and

8, the approximation was 30% to 45%. Very large approximation was evident during the late maturation period, from SMI 9 to 11. An important finding was at SMI 11, when general skeletal and facial growth was completed, the fusion midpalatal suture was only



Figure 2. Radiographic features of eleven skeletal maturity indicators

approximately half the total length of the suture. The percentage values increased continuously when the SMI stages progressed (Figure 3).

In this study, approximation (fusion) of suture occurred posteriorly in all subjects. No anterior approximation was seen in this study.

The results of this study revealed that there is highly significant correlation between skeletal maturation and the percentage of ossification of the mid-palatal suture and p value is < 0.001 (Table 1).

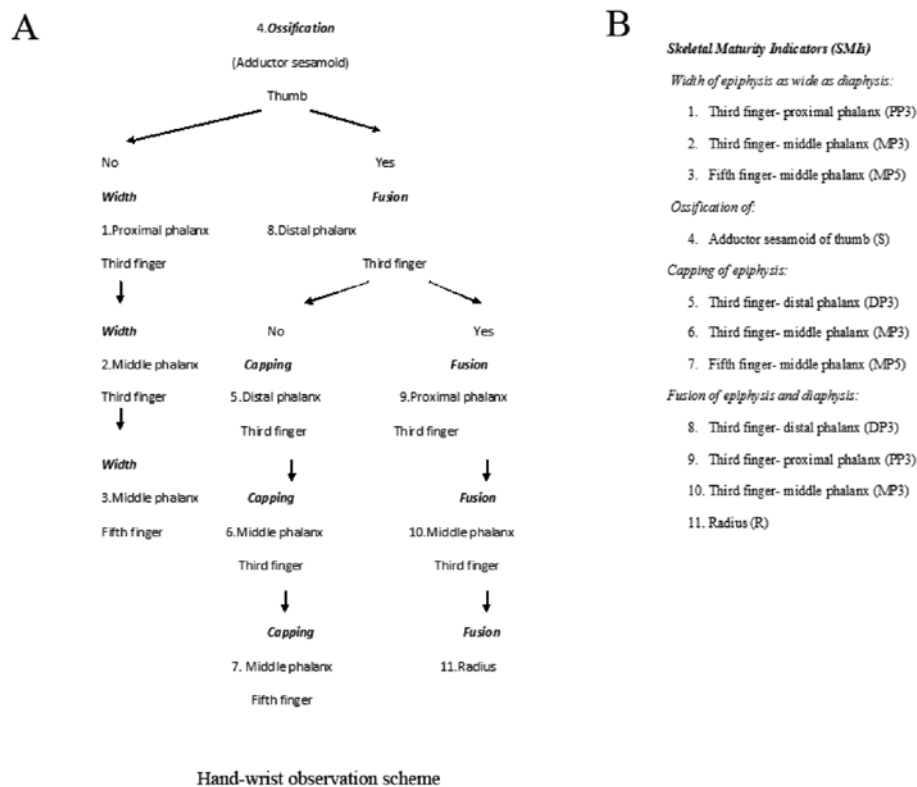


Figure 3.A. Hand-wrist observation scheme
3.B. Skeletal maturity indicators (SMA system)

Discussion

In the present study, correlation between the status of the mid-palatal suture on occlusal films and the skeletal maturity indicators assessed by means of hand-wrist films was evaluated. Both the male and female subjects demonstrated an increase in the amount of sutural fusion (approximation) as the SMI stage progressed. There was no significant difference in the amount of mid-palatal sutural approximation between the male and female groups, although the male values were slightly higher in numerical value.

In the same SMI stage, the chronological age of male subjects was older than the female samples because females mature earlier than males. Therefore, chronological age is not a reliable indicator for maturational evaluation.

According to Fishman, SMI 2 coincides with the onset of the adolescent growth. Fusion of mid-palatal suture is nearly 20% in that stage. SMI 6 is the maximum intense growth and has reached the peak of the growth spurt. At that stage, fusion of mid-palatal suture is nearly 30% in this study. Growth modification treatment must be done before the adolescent growth spurt ends. So, growth modification treatment can be done between 20% and 30% fusion of mid-palatal suture.

In SMI 11, the intense growth has reached the plateau level and the retainer may be safe to be removed. Fusion of mid-palatal suture is 50% and above at that stage. Moreover, general skeletal growth has completed at that stage and so orthognathic surgery can also be performed when the mid-palatal suture has fused 50% and above.

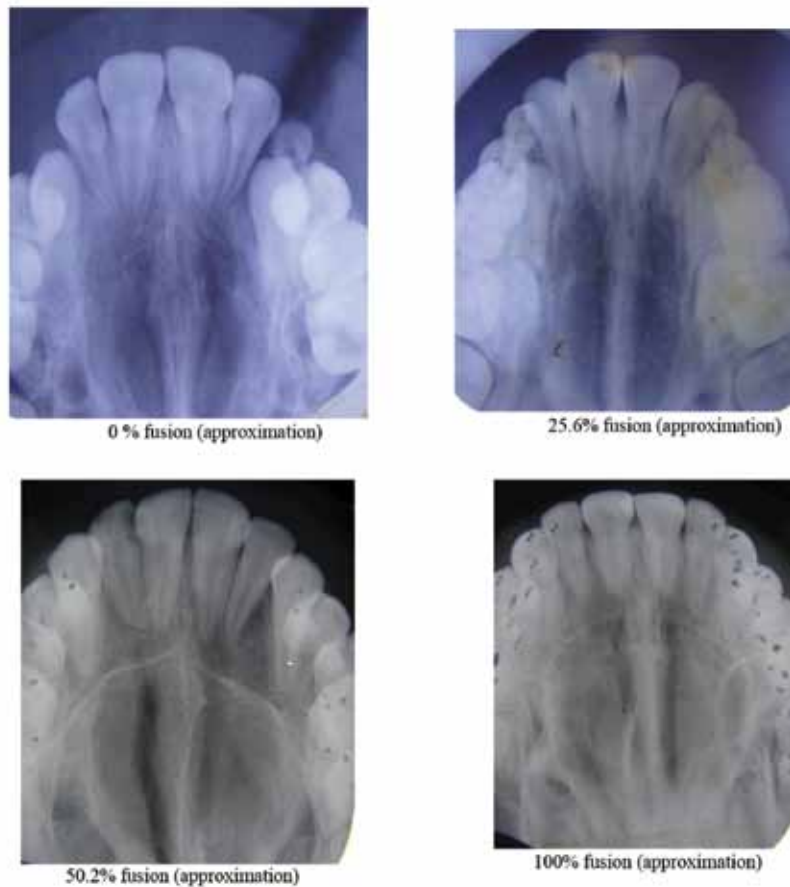


Figure 4. Percentage of fusion (approximation) of mid-palatal suture on standard occlusal radiographs

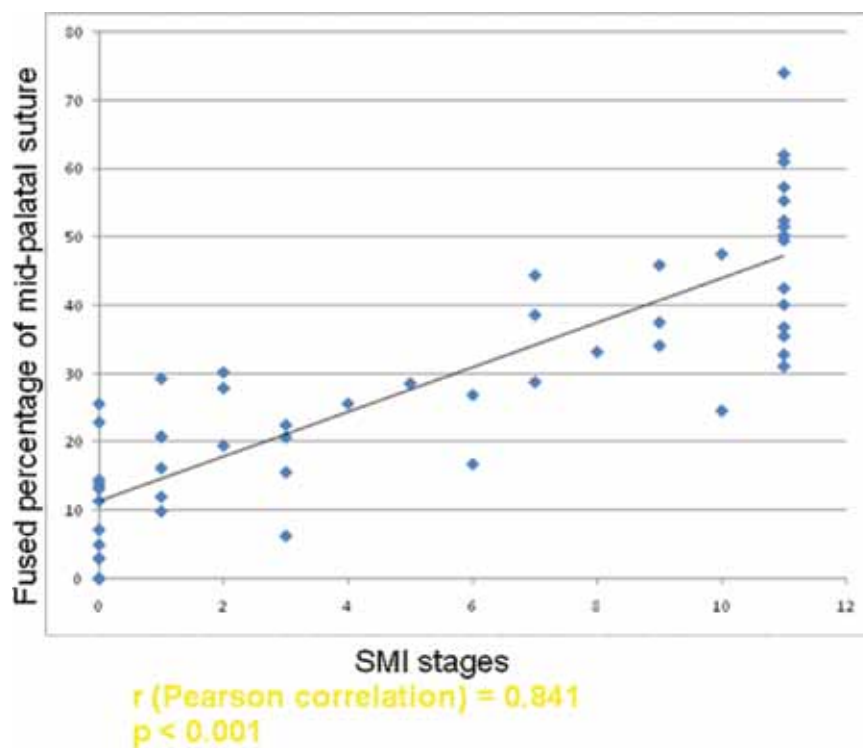


Figure 5. Correlation between SMI stages and mean percentage values of mid-palatal suture fused

Table 1. Correlation between SMI stages and mean percentage values of midpalatal suture fused

Parameters	N	r(Pearson correlation)	P
SMI stages and Mean % of fused suture	51	0.841	<0.001

The different levels of maturation were seen in the same SMI stage. In this study, levels of maturation were specified according to the Fishman's data (chronologic age value for adolescent skeletal maturity indicators). There did not appear to be any distinguishable pattern of approximation of the suture in the different levels of maturation. Delayed maturers and accelerated maturers were seen in some SMI stages. But, most of the subjects were average maturers.

Although the accelerated maturers demonstrated more approximation than the average group in SMI 9, less approximation was seen in accelerated maturers than average group in SMI 1 and 10 of this study. In general, mean percentage value of approximation of average maturers increased continuously when SMI stages increased except in SMI 3. In SMI 3, there was only one subject while the other values of the other SMI stages were average on more than one subject.

Conclusion

The results of this study revealed that there is highly significant correlation between skeletal maturation and the percentage of ossification of the mid-palatal suture. Percentage of fusion of mid-palatal suture from standard occlusal radiograph can be used as a maturational indicator to decide treatment timing for growth modification treatment, removal of retainer and orthognathic surgery. Orthodontic mechanics could be efficiently designed if more of the force value is expressed more posteriorly to the suture. Most appropriate time for skeletal expansion of the palate can be suggested during the period of very high growth velocity (SMI 1-6). Fusion of mid-palatal suture in SMI 1-6 is up to 30%.

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Original Article

In vitro study of Coronal Leakage of Four Temporary Filling Materials Immersed in Alcoholic Methylene Blue Dye

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Abstract

Introduction: Temporary restorative materials are placed in access cavity to provide the coronal seal of the root canal during multi-visits RCT. This in vitro study was designed to evaluate the coronal microleakage of four different temporary restorative materials commonly used in endodontics in Myanmar, viz., MD.Temp, Orafil, Caviton, Zinc oxide eugenol.

Materials and Methods : Forty-four extracted human premolars were selected, and access cavity was prepared. Pulp chambers were filled with wet cotton pellets leaving approximately 4 mm coronally. Forty teeth were randomly divided into four experimental groups equally. The remaining four teeth were equally divided into two control groups. Access cavities in each group were filled with one of the above tested materials, and immediately put into the water. Tooth surfaces except occlusal surface were then coated with nail varnish. Equal parts of 2% methylene blue and methylated alcohol were mixed to prepare a dye solution. Samples were immersed in dye for 10 days at $32 \pm 2^\circ\text{C}$. Teeth were rinsed, dried, and sectioned mesiodistally and evaluated under a stereomicroscope at a magnification of 15X for linear dye penetration along cavity walls. Data were analyzed using Kruskal-Wallis and Tukey HSD tests.

Results : The lowest microleakage value was observed in MD.Temp and Orafil, and the highest in Zinc oxide eugenol (ZOE). Caviton was not statistically different from Orafil and ZOE, but significantly higher in microleakage than MD.Temp.

Clinical Significance : ZOE which is dissolvable in alcohol was the least effective material for preventing microleakage, while MD.Temp and Orafil provided the best sealing in content of alcohol in this study.

Introduction

Endodontic treatment aims to eliminate infections in the root canal system and to prevent reinfection ultimately. Maintenance of asepsis in the canal during endodontic treatment is paramount (Yun et. al. 2012). It is estimated that more than 500 species are able to colonize in the adult mouth and that any individual typically harbors 150 or more different species (Teughels et. al. 2012). Different food types for raw consumption contain enterococci commonly (Kampf et. al. 2007). They can penetrate into the canal if there is no coronal seal and it may lead to reinfection then result endodontic failure.

An inadequate coronal seal will allow canal contamination by penetration of saliva, nutrients, chemicals and importantly microorganism and by products. Swanson and Madison (1987) reported that saliva leakage through coronal seal can reach 85% of canal length. This saliva can dissolve the sealer and extensively contaminate the gutta-percha then develop pathologic lesion in treated cases (Aminozarbian et. al. 2009). In multi visits RCT, the pulp space must be closed with temporary cement during visits (Cohen & Burns 2002).

A commonly suggested cause of endodontic failure is apical leakage due to inadequate apical seal (Swanson & Madison 1987). But lack of satisfactory temporary coronal seal during RCT is also important cause for endodontic failure while it is ranked second amongst the contributing factors in continuing pain (Naoum 2002, Naseri et. al. 2012). There must be an adequate seal to prevent bacteria and fluid from contaminating the canal. They also prevent escape into oral cavity of medicaments placed in the pulp chamber (Shahi et. al. 2010). Coronal microleakage appears to be of equal or greater clinical relevance as a factor in endodontic failure than apical leakage due to risk of recontamination (Aledrissy et. al. 2011). Sealing of access cavity during endodontic treatment visits

is essential element in achieving endodontic success (Walton & Torabinejad 1996).

Temporary restorative material should provide permanent air tight seal as coronal seal until treatment is completed or permanent restoration (Djeri et. al. 2010). Failure of temporary material is usually due to the lack of thickness of material, improper placement of material and failure to evaluate the occlusion after placement. Allowing temporary filling to remain longer than three weeks is an invitation to coronal leakage (Bellamy 2004). Space for material, occlusal forces and length of time till permanent restoration are also considerable factors. Factors; including coefficient of thermal expansion, modulus of elasticity or handling property may affect on temporary filling materials (Yun et. al. 2012). Dissolution of coronal seal can be potential for oral fluid and bacterial contamination of root canal space (Swanson & Madison 1987).

In most of the microleakage studies, carried out for determination of sealing ability of temporary filling materials, thermocycling and mechanical loading are used to simulate temperature changes and occlusal stresses that take place in vivo. Temperature changes is thought as a cause of failure of temporary restoration because of dimensional changes; shrinkage and expansion. Besides, chemical dissolution should also be considered for failure of temporary restorative materials. Thus, beverages and foods containing alcohol should also be considered in the deterioration of temporary filling materials. Eugenol is freely soluble in alcohol (Madjackfrost 2009). So, eugenol containing temporary filling could deteriorate by exposure of alcohol in the oral cavity. Thus, this study was designed to evaluate the coronal seal of four commercially available temporary restorative materials, viz., MD.Temp, Orafil, Caviton, and Zinc oxide eugenol (ZOE), immersed in a dye solution that contained alcohol.

Materials and Methods

Forty-four caries free, extracted human premolar teeth were selected and stored in 10% formalin solution. Calculus, tissue remnants and staining were removed from teeth and rinsed. Standard access cavity for premolar was prepared on the occlusal surface of each tooth using #4 fissure diamond burs to get similar sized and shaped access cavities for all specimens. The teeth were irrigated by using 2.5% sodium hypochloride solution to remove remaining debris, pulp tissues, and smear layer in the canal. A periodontal probe was used to measure the depth of the opening assuring that it could accommodate at least 4 mm of the tested temporary filling materials. The teeth were divided randomly into four experimental groups, Group I, II, III and IV, each group consisting of 10 teeth, and also two control groups, negative and positive, consisting of two teeth in each group.

A wet cotton pellet was placed at the bottom of the access cavity leaving about 4 mm of depth to give room for the filling materials. The temporary restorations, viz., MD.Temp (MetaBiomed Co. Ltd., Korea) (Fig.1), Orafil (PrevestDentPro Ltd, Jammu, India) (Fig.2), Caviton (GC Corporation, Tokyo, Japan) (Fig.3), and Zinc Oxide and Eugenol (PrevestDentPro Ltd, Jammu, India) (Fig.4), were introduced into the access openings of the experimental groups from the bottom up with the use of a plastic instrument.

In Group I, the inserted material was MD.Temp, in Group II, III and IV, the materials placed were Orafil, Caviton and Zinc Oxide Eugenol respectively. MD.Temp, Orafil and Caviton are pre-mixed materials, so, were inserted into the access incrementally to avoid voids and porosity in the fillings. Zinc oxide powder and Eugenol liquid were mixed according to guideline of Notes on Dental Materials by E.C.Combe, (sixth edition, 1992, Churchill Livingstone, London) since there was no specific instruction of manufacturers. Powder and liquid ratio was 4/1 to get thick paste. Thin glass slab and stainless steel spatula were used in mixing. After ZOE was prepared as thick paste, it was inserted into the cavity as in above materials.



Fig. 1.MD.Temp
(MetaBiomed Co. Ltd., Korea)



Fig.2.Orafil
(PrevestDentPro Ltd, Jammu, India)



Fig. 3.Cavition
(GC Corporation, Tokyo, Japan)



Fig.4.Zinc Oxide and Eugenol
(PrevestDentPro Ltd, Jammu, India)

Table.1. Tested temporary filling materials, their compositions and manufacturers

Material	Composition	Manufacturer
MD.Temp	Zinc Oxide, Zinc Sulfate, PVA-PVC	MetaBiomed Co. Ltd., Korea
Orafil	Zinc oxide, Zinc sulphate, Calcium sulphate, Plasticizers, resins, mint aroma and excipients	PrevestDentPro Ltd, Jammu, India
Cavition	Dental Plaster, Zinc Oxide , Vinyl acetate resin, Ethanol	GC Corporation, Tokyo, Japan
ZincOxide Eugenol	Powder; Arsenic free, extra pure zinc powder Liquid; Extra pure Eugenol oil	PrevestDentPro Ltd, Jammu, India

The surfaces of filling materials placed in the specimens were smoothed with cotton pellet moistened with distilled water, and immediately put into distilled water. The two positive control teeth were just filled with cotton pellets to allow leakage, and the two negative control teeth were filled with soft sticky wax to prevent leakage. The specimens' surfaces were double coated with nail varnish except 1 mm around the restorations (Fig.5).



Fig.5.Specimens coated with nail varnish

All the specimens were then immersed in 2% methylene blue dye solution, which was mixed with equal part of methylated alcohol, at room temperature ($32\pm 2^{\circ}\text{C}$) for 10 days (Fig.6).



Fig.6.Specimens immersed in dye solution

The teeth were then rinsed, dried, and longitudinally sectioned in a mesiodistal direction using a slow speed diamond disc under constant water. Dye leakage was scored using a stereomicroscope at a 15X magnification (Fig.7.a, b, c and d). The scoring was as follow: score 0 = no leakage, score 1 = leakage through one fourth of the cavity, score 2 = leakage through half of the cavity, score 3 = leakage through three-fourth of the cavity and score 4 = leakage through full length of the cavity. Then, the results were analyzed using Kruskal-Wallis and Tukey HSD test as post hoc.

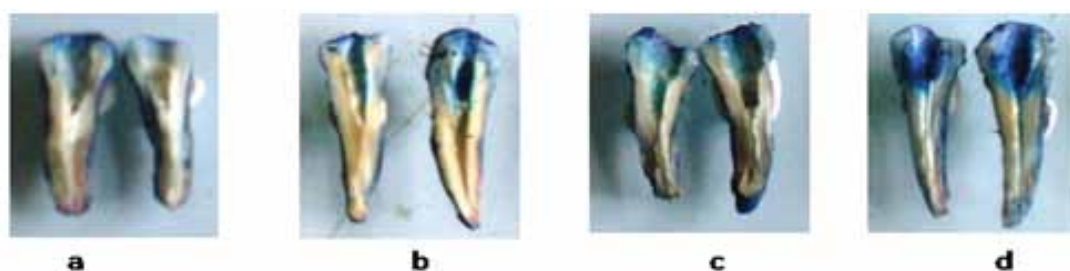


Fig.7.Specimens showing leakage of dye;
a. MD. Temp group, b. Orafil group, c. Caviton group, d. ZOE group

Results

The negative control group showed no dye penetration, and the positive control group demonstrated maximum dye penetration. The specimen of ZOE group showed the highest dye leakage among all of the specimens (Fig.7.d). Dye penetration into the specimens of MD.Temp, Orafil and Caviton are shown in Fig.7.a, band c. The mean marginal dye leakage scores described in ranks are presented in Table 2, and the results of multiple comparisons are given in Table 3.

According to the results obtained by comparison, there was no significant difference between MD.Temp and Orafil ($p=0.998$), but MD.Temp was significantly low in microleakage than the specimens of Caviton ($p=0.041$) and ZOE group ($p=0.001$). Orafil showed significant lower

score of microleakage than ZOE ($p=0.001$), but not significantly different from Caviton ($p=0.061$). ZOE was the temporary filling cement that exhibited the highest leakage score but not statistically different from Caviton ($p=0.413$). Thus, it indicates that ZOE has lower sealing property than MD.Temp and Orafil.

Table 2. Mean ranks of the leakage scores of the temporary filling materials

(Same letters indicate no statistically significance.)

Materials	Mean Rank
MD.Temp	13.60a
Orafil	13.55ab
Caviton	24.40bc
ZOE	30.45c

Table 3. The results of multiple comparisons carried out by using Turkey HSD test at 95% confidence interval ($p < 0.05$)

	Orafil	Caviton	ZOE
MD.Temp	0.998	0.041*	0.001*
Orafil		0.061	0.001*
Caviton			0.413

(*) indicates statistically significant differences at $p < 0.05$

Discussion

A temporary restoration is the restoration placed within an endodontic access cavity that has been cut through an interim restoration or through tooth structure (Jensen et. al. 2007). So many microleakage studies about temporary restoration were performed for a long time.

The integrity of temporary restorations used during endodontic treatment has been usually assessed with dye penetration to attempt to simulate bacterial ingress between the tooth and the restorative materials, especially methylene blue dye. Methylene blue dye has smaller molecular size than bacteria to diffuse. Some of the literatures pointed out that the methylene blue dye studies may reveal misleading conclusion (Veri'ssimo & Vale 2006). However, the tested temporary fillings give satisfactory seal with this methylene blue dye, we believed that these materials are reliable to use clinically. In this study, alcohol which may be deteriorative agent for temporary fillings was mixed with dye. Restoration thickness of 4mm is placed in the study because minimum 3.5 to 4 mm thickness of temporary restoration is needed to prevent coronal leakage (Aledrissy et. al. 2011).

Today, commonly used temporary restoratives are hydraulic temporary sealing materials, zinc oxide eugenol based materials and resin based cements. MD.Temp, Oralfil and Caviton contained calcium sulphate and resin (PVA-PVC). So they are plaster based or zinc oxide/ calcium sulphate preparations. In other words, they are hydraulic temporary filling materials. Hydraulic temporary sealing materials are based on calcium sulphate: they set upon contact with saliva in the oral cavity. During setting, the materials begin to chemically react and adhere to dentin as they undergo linear hygroscopic expansion like plaster (Ogura & Katsuumi 2008). The hygroscopic expansion of hydraulic temporary filling materials provides good adaptation between the restoration and cavity walls. So they provide a tight seal in endodontic access cavities and prevent microleakage. ZOE and its based temporary filling show lower sealing ability through so many studies. They showed lower property when they meet with thermal stress since it probably be attributed to the instability of zinc oxide (Aledrissy et. al. 2011). And inconsistencies in the mixing process and lack of homogeneity lower its sealability. Because of these, ZOE based materials are believed to be less leakproof among temporary restorative materials.

In the study made by Aledrissy et. al. (2011) tested with thermal cycling and immersed in methylene blue dye for 10 days, calcium sulphate based temporary material showed the lowest leakage followed by zinc phosphate cement, then ZOE sample had worse result. On the other hand, several in vitro studies using silver nitrate as an indicator (Noguera & McDonald 1990), calcium chloride radioisotope, dye penetration (Lee et. al. 1993, Mayer & Eickholz 1997), fluid filtration method and bacterial penetration (Deveaux et. al. 1992), all demonstrated that IRM (ZOE based material) provides sealing properties inferior to those of Cavit (plaster based material) (Naoum 2002).

In this study, 2% methylene blue dye solution was mixed with equal part of methylated alcohol in attempt to simulate the alcoholic beverages and food. Our hypothesis is that the temporary filling materials that contain substance which is highly soluble in the alcohol will certainly show a greater microleakage than those containing substance which is less soluble in it. Greater dye penetration found in the specimens of ZOE is believed to be due to its solubility in the alcohol since eugenol is unstable in alcohol, or the permeability of alcohol into the material. The dissolution of set ZOE in fluid is high mainly due to elution of eugenol (Combe 1992). Eugenol is freely dissolvable in alcohol (Madjackfrost 2009).

Thermocycling is the most performed procedures in microleakage studies that tested thermal changes that affect on dimension of set temporary filling materials by expansion and shrinkage. Intraoral temperature is usually accepted as approximately 35°C. It can change depending upon the foods and drinks that we eat; ranging from 1.0°C to 58.5°C (Gale & Darvell 1999). These temperature changes may lead to the dimensional changes of filling materials.

But Deveaux et. al. (1992) found that thermocycling had no significant effects on microleakage but it does affect the various temporary materials. In fact, hygroscopic temporary fillings will expand either in hot moisten or in cold moisten environment and provide tight seal. Oral cavity is almost always moistening. So, validity for application of thermal stresses for the study of temporary restoration may be doubtful.

Though consideration of thermal and mechanical stresses as causes for leakage seems to be meaningful, chemical dissolution should not be

overlooked for consideration of microleakage. In the case of temporary restorations, it is possible that the disintegration of the restoration margin is associated with the dissolution of certain components of the materials in the oral fluid. Therefore, beverages and foods containing alcohol could be considerable factor. There are so many alcoholic fermentable, alcohol flavored and alcohol contained foods in our traditional diet. Alcohol could be retained in cooked foods also. According to a survey, an average American adult drinks 386-packs of beer, 12 bottles of wine & 2 quarts distilled spirits of alcohol per year. Besides, some of mouthwash contains alcohol from 6.6 % to 26.9 % (Lachenmeier et. al. 2012). Concentration of methylated alcohol that we used is about 70%. And the concentration of alcoholic beverages is ranged from 0.0% to 99 % (Wikipedia.com 2012).

In this study, teeth specimens were immersed in alcoholic dye for 10 days. Actually alcoholic foods and drinks just pass the oral cavity. But the residual alcohol after drink remains for 15-20 min in the oral cavity (Langille & Wigmore 2000). Although immersion of teeth specimens in alcoholic dye for 10 days is irrelevant to in vivo nature, that is just consideration of alcohol as a deteriorative factor. Repeated drinking will last the exposure time more and it may favour for dissolution of eugenol. However staying of alcohol in mouth can deteriorate the ZOE materials and this study is more relevant for alcohol-drinkers.

MD.Temp and Orafil exhibited minimal microleakage when compared with the ZOE group. This result for this study implies that these two materials are more resistant to dissolution in alcohol or less permeable to it than ZOE cement. In other way, hydraulic temporary filling materials provide better coronal seal by hygroscopic expansion during their setting. According to the results obtained from this preliminary experiment, alcohol has certain effects on temporary filling material especially on those containing zinc oxide compounds. Therefore, further studies are needed to gain more insight in the effect of alcohol containing foods on temporary filling materials.

Clinical significance

ZOE based temporary filling materials are not reliable to prevent the microleakage of temporary restorations due to the fact that these materials will deteriorate rapidly in the alcohol containing food and drink according to this study. The hydraulic or calcium sulphate based temporary restorative materials are seemed to possess ability to seal the coronal sealing and to prevent microleakage better in involvement of alcohol. The temporary filling materials which are not dissolving in or not permeable to alcohol should be considered for temporary restoration.

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Original Article

The use of Lycopene in Oral Potentially Malignant Disorders

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Oral malignancy is one of the most common malignancies leading to death worldwide and ranks 6th among all cancers. It could be preceded by clinically evident oral potentially malignant disorders (OPMDs) which are in the form of white or red patches and have greater risk of transforming into malignancy (Reibel, 2003). The OPMDs include oral leukoplakia, oral erythroplakia, lichen planus and lichenoid reactions, oral submucous fibrosis, discoid lupus erythematosus and actinic keratosis (Warnakulasuriya et al., 2007). The common causative factors are areca nut, catechu slaked lime and tobacco (Figure 1).

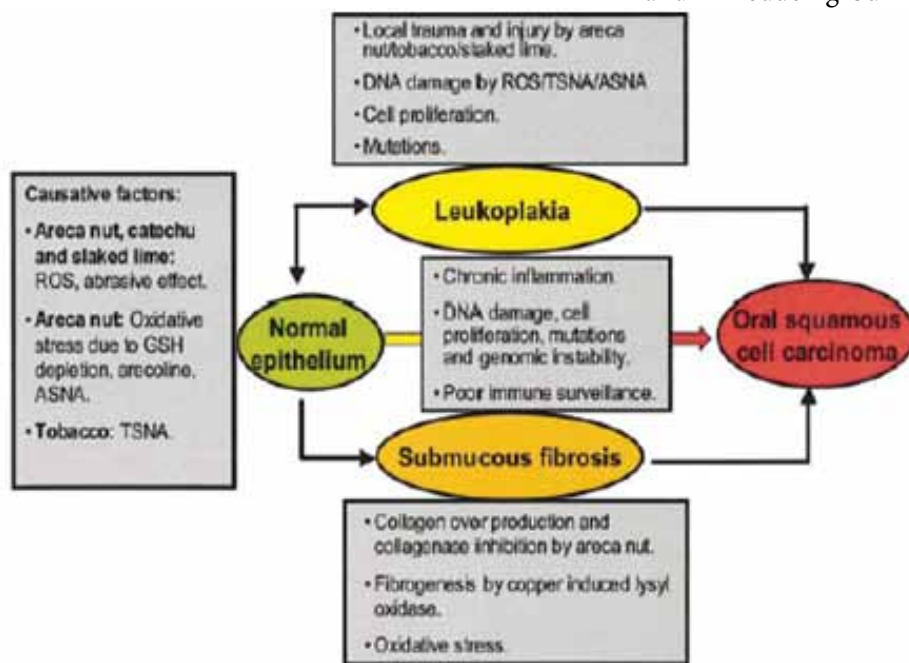


Figure (1) Causative factors and mechanism implicated in induction of leukoplakia, submucous fibrosis and oral squamous cell carcinoma (Nair et al., 2004)

Oral leukoplakia is the most common OPMDs in which malignant transformation occurred (Petti, 2003). Leukoplakia is currently defined as a white patch or plaque that cannot be scrapped off and cannot be attributed to any other diagnosable disease, but habit of tobacco is always present (Neville, 2002). Nagao et al suggested that improvement of levels of

lycopene may protect against the relative risk of oral leukoplakia in Japanese male population (Nagao et al., 2000). For the management of oral leukoplakia, patients receiving lycopene showed highly significant difference in clinical response compared with patients receiving placebo (Singh et al., 2003; Lu et al., 2010). Oral submucous fibrosis is a chronic debilitating disease of oral cavity associated with areca nut (betel-nut) chewing, affecting all parts of oral mucosa and oro-nasopharynx. A malignant transformation rate of about 0.5-6%. Lycopene either singly or in combination with intralesional steroid injections was more efficacious in improving the mouth opening and in reducing burning sensation symptoms than

the placebo treatment (Kumar et al., 2006). Oral Lichen Planus (OLP) is a chronic, immunological, mucocutaneous disease occurs in about 2% of the adult population, affecting the skin and/or oral mucosa. OLP presents as white striations, white papules, white plaques, erythema, erosions, or blisters affecting predominantly the buccal mucosa, tongue and gingiva. Ulcerated, erosive, or atrophic areas are generally regarded as at greater risk of malignant

transformation about 20-72% (Andreasen, 1968; Pindborg et al., 1972). Lycopene is a natural pigment synthesized by plants and microorganisms but not by animals (Story et al., 2010). It is accumulated in relatively few tissues and can most easily be seen in ripe tomatoes, watermelons, grapefruits, guavas, rosehips and red chilli, giving them characteristic red color (Seren et al., 2008). Tomato and tomato-based foods account for more than 85% of all the dietary source of lycopene (Rao et al., 1999) (Figure 2).



Figure (2) Dietary source of lycopene

Oxidative stress caused by reactive oxygen species (ROS) can result in damage to macromolecules such as proteins, carbohydrates, lipid, and DNA and may be involved in carcinogenesis. Antioxidants should be the necessary part of prevention and therapeutic regiment of oral malignancies (Lu et al., 2010). Lycopene has some beneficial effects in the treatment of certain diseases of oral cavity including oral cancer and precancerous lesions (Kumar et al., 2007; Mayne et al., 2004).



Figure (3) Tomatec® (Fame)

Materials and Methods

A total of 52 oral submucous fibrosis (OSMF), 5 oral leukoplakia and 15 oral lichen planus

(OLP) patients were included in the study between November 2010 to the end of 2011 in the Department of Oral Medicine, University of Dental Medicine, Yangon. Routine evaluation included recording the history of tobacco usage both smoking and chewing, ethanol usage, in OSMF and Oral leukoplakia. The clinical assessment included pain, burning sensation, vascularization of the whitish area in both oral lichen planus and oral leukoplakia. In case of OSMF, mouth opening was assessed by measuring from the mesioincisal edge of the upper left central incisor tooth to the mesioincisal edge of the lower left central incisor tooth. The measurement was made using a geometric divider and scale and

was recorded in millimeters. Lycopene used in this study was Tomatec® 10 mg (Figure 3) manufactured by Fame Pharmaceuticals. We prescribed Lycopene (Tomatec®, Fame Pharmaceutical) 10 mg BD and Nature-C® (Fame Pharmaceutical) 500 mg BD, topical application of steroid and antifungal along with mouth opening exercise without intralesional steroid injection for early stage and with intralesional steroid injection for advanced stage of OSMF. For Oral leukoplakia, advised to take lycopene along with topical antifungal agent. For OLP, prescribed Lycopene (Tomatec®, Fame Pharmaceutical) 10 mg BD and Nature-C® (Fame Pharmaceutical) 500 mg BD along with topical application of corticosteroid. In atrophic and bullous type of OLP, systemic corticosteroid were prescribed along with topical agent. Patients were evaluated every 7–10 days during the treatment period and then every 15 days during the follow up period.

Results and Discussion

Age and sex distribution

Among total cases of 72 OPMDs, 56 male and 16 female were recruited. Male to female ratio was 3.5:1. Age range was 18 to 67 years. Males were predominant as previous studies (Lai et al., 1995). Most of the patients were 21 to 30 years of age in this study. Maher et al. 1994 reported that 70% of males with submucous fibrosis were under 30 years of age. In another study conducted in 1991 by Borle and Borle in 326 patients, the majority of patients also were under 30 years of age (Borle and Borle, 1991).

Habits

All patients in the present study gave a positive history of areca nut chewing in the raw form, as a quid or in a commercial preparation such as shikhar. The median duration of habits was found to be 11 years. The frequency of chews per day varied between 1 and 35 quids per day. All OSMF and oral leukoplakia patients gave a history of areca nut chewing. In OLP, some patients did not have any oral habits. The minimum mouth opening (IID) is 18mm in OSMF cases. A total of 72 cases, 58 cases were lost to follow up, leaving only 14 evaluable, of whom 9 were completed and remaining are still under treatment.



Figure. 4(A) Early stage of Oral Submucous Fibrosis (IID=37mm)

We prescribed Lycopene (Tomatec®, Fame Pharmaceutical) 10 mg BD and Nature-C® (Fame Pharmaceutical) 500 mg BD, topical application of steroid and antifungal along with mouth opening exercise without intralesional steroid injection. Lycopene was useful in effectively reducing the burning sensation and stiffness within 2 weeks. After 3 months, marked improvement in mouth opening were recorded when compared with initial mouth opening in early stage of OSMF cases.



Figure. 4(B) After 3 months (IID=45 mm)



Figure. 5(A) In advanced stage of OSMF (IID=24mm)

In advanced stage of OSMF, we prescribed intra-lesional kenacort (10 mg/ml) injection once a week for 3 months along with Tomatec® (Fame Pharmaceutical) 10 mg BD and Nature-C® (Fame Pharmaceutical) 500 mg BD, topical application of steroid and antifungal plus mouth opening exercise. In advanced case, improvement of mouth opening and marked relief of burning sensation were seen after 6 months.



Figure. 5(B) After 6 months (IID=44 mm)

The combination of lycopene and intra-lesional steroids conferred greater benefits in mouth opening and the effect was seen by the third week of treatment. The better results may be attributed to the synergistic action of lycopene with steroids, both of which have been known to modulate the inflammatory response (Heber and Lu, 2002). In our study, the improvement was seen with the combination of lycopene with steroids but long term follow up study of the patients to fix the dose and duration of therapy is necessary to validate the usage of therapy in OSMF cases and prevent malignant transformation.

Leukoplakia



Figure. 6(A) Before treatment



Figure. 6(B) After treatment with Biocrush

He complained of white patch at the left marginal and attached gingiva opposing to 36 region for more than 6 months duration. We prescribed Lycopene (Tomatec®, Fame Pharmaceutical) 10 mg BD and Nature-C® (Fame Pharmaceutical) 500 mg BD along with topical application of antifungal agent. The lesion was not significantly improved after 3 months and complained that the area became more thicker. After Biocrush (250mg) (Fame pharmaceuticals) BD was added for one month, totally eradication of white patch area was seen. No side effects, toxicity of any sort were encountered in duration of the therapy. Ongoing studies regarding on effect of Biocrush on Oral leukoplakia should have to be carried out (Figure 6 C).



Figure. 6(C) Biocrush® (Fame)

Oral Lichen Planus (Erosive type)



Fig. 7(A) Before treatment (Right side)



Fig. 7(B) Before treatment (Left side)

We prescribed Lycopene (Tomatec®, Fame Pharmaceutical) 10 mg BD and Nature-C® (Fame Pharmaceutical) 500 mg BD, Completec (Fame) BD along with topical application of corticosteroid and relieved the symptoms of pain and burning sensation on the next day.



Fig. 7(C) 1 week after treatment (Right side)



Fig. 7(D) 1 week after treatment (Left side)

Conclusion

Although satisfactory results had been achieved in this study, numerous losses to follow up were also encountered. This may be due to socioeconomic problems, difficulty in transportation, relief of major symptoms or may be noncompliance. Lycopene was efficacious as a safe, reliable drug in the management of oral submucous fibrosis cases who took regular treatment and follow up. Lycopene has several potent anti-carcinogenic and antioxidant properties and has been found to inhibit human fibroblast activity in vitro suggesting its possible role in the management of oral submucous fibrosis. Improvement in mouth opening was seen compared with the initial stage. According to the literatures, lycopene was a very promising antioxidant as a non surgical treatment modality in oral leukoplakia. In our study, improvement was only occurred in thin leukoplakia. The efficacy of Biocrush (Tabin-daing-

mya-nan) in management of oral leukoplakia should need to be studied. In case of symptomatic OLP (atrophic or erosive disease), the associated symptoms were relieved, recurrence were also manageable after prescribing lycopene together with administration of systemic corticosteroids. More than 50% of the population do not attend for dental check up regularly and there is evidence that many cases are missed, even by dental practitioners. The program of oral cancer detection and screening is like a war, and should be backed by full government support, cooperation of school educator, news media, medical services, and general awareness from the whole population. As health care workers, we need to know the important role of our profession not only in the screening and detection but also in the management of OPMDs.

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CONTENTS

Editorial	3
An Infection Control Practice: Disinfection of Dental Impressions	
Review Article	6
Ameloblastoma : Approaches to diagnosis and management	
Original Article	12
Accessment of obturation on the simulated lateral canals of root canal system between heat only and heat associated with vibration technique	
Original Article	20
Does visual perception have more impact for effective learning in dental anatomy (Tooth carving practical session)?	
Original Article	25
A study on maximal biting forces of old and new complete dentures	
Original Article	30
Correlation between sulcular and capillary blood glucose levels in periodontal patients by using glucometer	
Original Article	36
Assessment of Oral Health Status and Awareness of Dental Problems among Young Female Adults	
Original Article	42
Maturational evaluation of ossification of the mid-palatal suture	
Original Article	50
In vitro study of Coronal Leakage of Four Temporary Filling Materials Immersed in Alcoholic Methylene Blue Dye	
Original Article	58
The use of Lycopene in Oral Potentially Malignant Disorders	

Editorial Board

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